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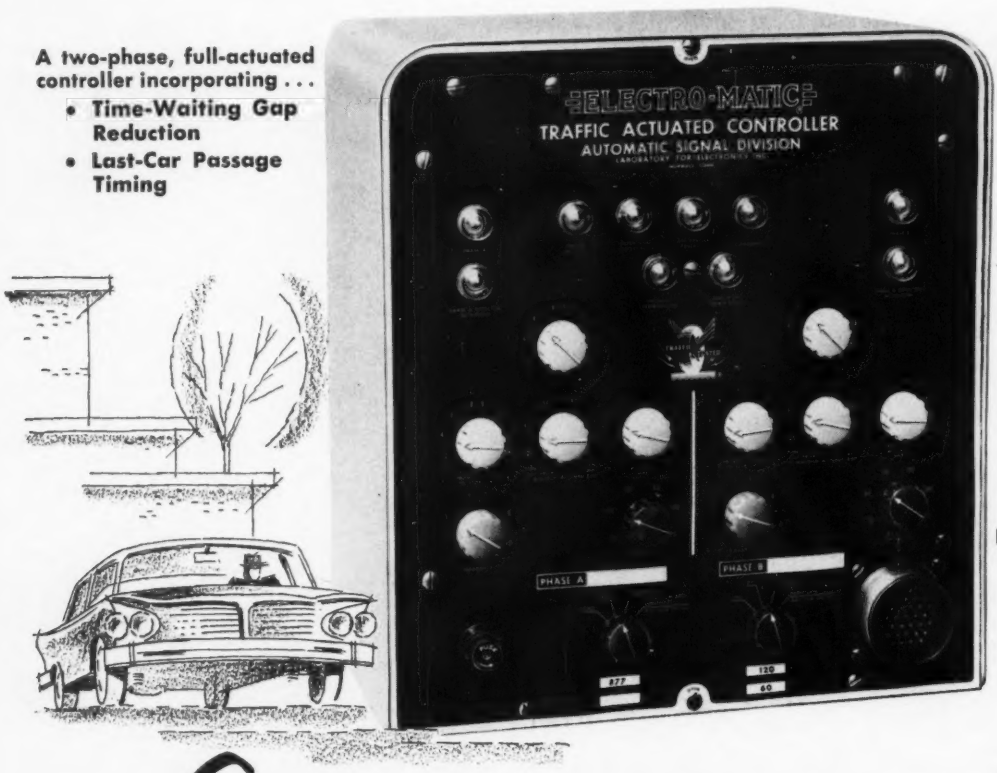

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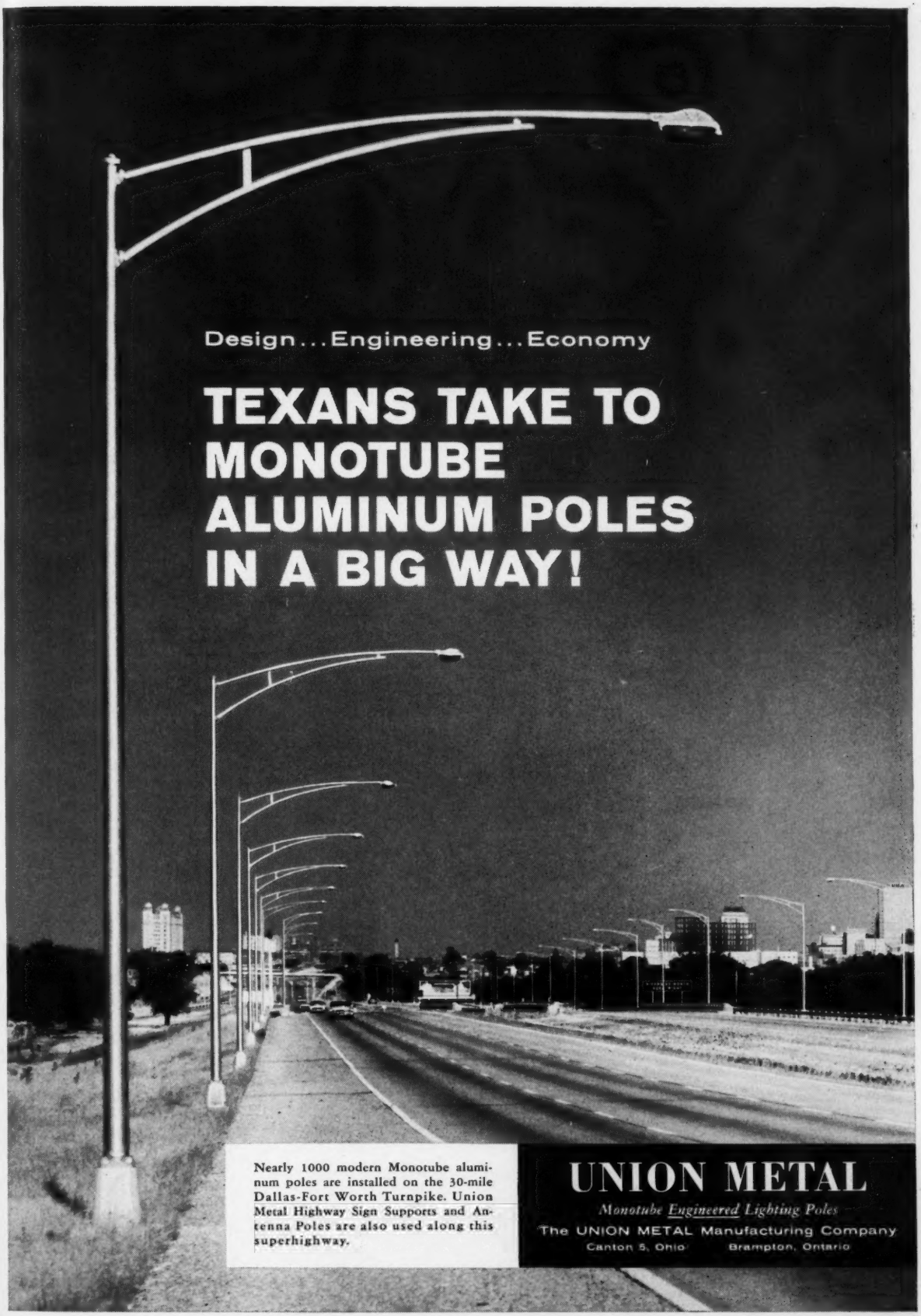
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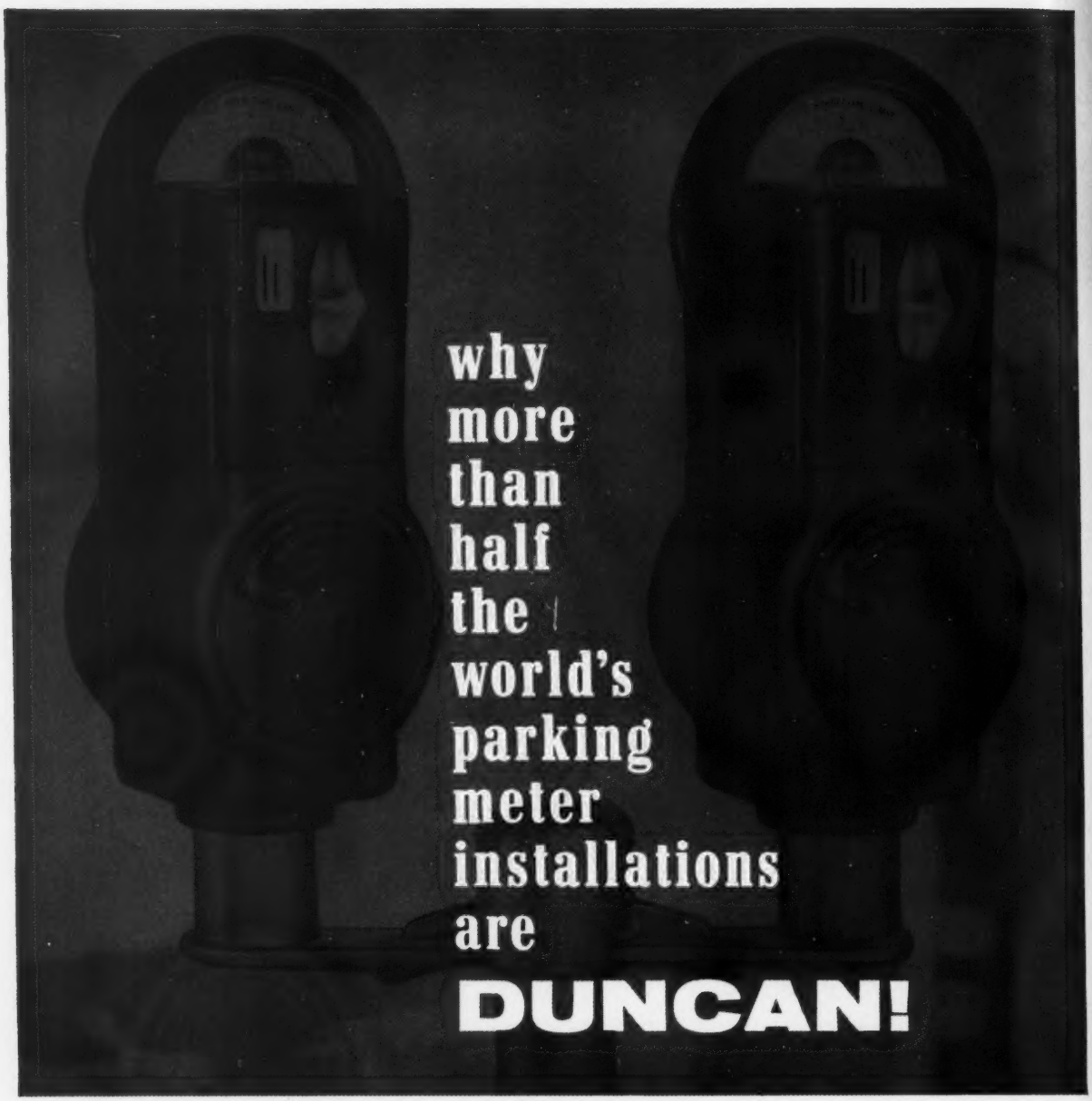

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TRAFFIC ENGINEERING

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Cover: Cleveland's Public Square at Christmas, lighted not only by extensive decorative lighting but also by more than 100 modern fluorescent luminaires. Incidentally, the Square was the site of the world's first street lighting, installed April 29, 1879.
— Photo courtesy General Electric Co.

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Frankly Speaking . . .

Responsibility With Maturity

THE TRAFFIC ENGINEERING profession has been given a challenge. Although challenges are not new to the profession, it is nevertheless a challenge of maturity which it behooves all of us to recognize and to live up to. I am speaking of the recent appointment of a traffic engineer to the post of Deputy Federal Highway Administrator.

The appointment of a traffic engineer to this position is recognition of our profession and the many basic areas of concern that the traffic engineer is confronted with—research, both pure and operational, planning (system as well as unit), and operational surveillance. The traffic engineer is always concerned with these items and I'm sure that the Secretary of Commerce and the Federal Highway Administrator were cognizant of a need for strengthening these areas within the Bureau of Public Roads and its working relationship with the states.

The profession must now assume a responsibility of constructive work in these areas of concern—research, planning, and operations. The profession no longer can "tinker and experiment"; it must be positive, it must be dynamic, and it must be thoughtful and thorough in its actions. Our responsibility is in the trust that has been placed in our profession and recognized administratively through one of the top positions in the highway field in the country which work with men of all disciplines for the betterment of the transportation system of this country. I know that the traffic engineer is capable of meeting this challenge and is proud of the opportunity and recognition that has been brought to one of its group.

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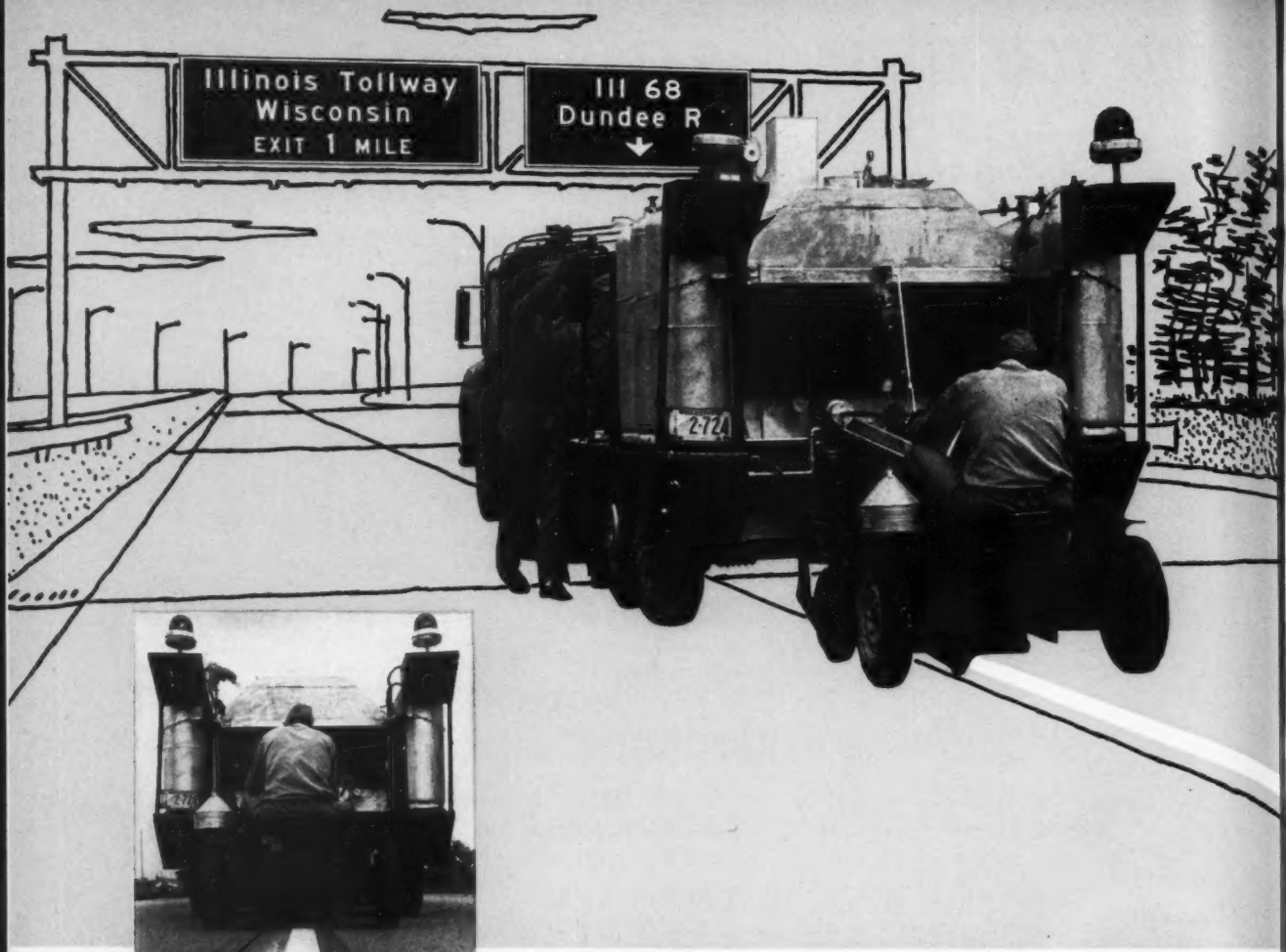

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Some Thoughts on Meeting Highways Needs

By David K. Witheford
Assistant Study Director
Pittsburgh Area Transportation Study

MOST PLANNING and highway officials are well aware that the problem of future traffic congestion posed by growing urban travel can be met, and must be met, by construction of controlled access highways. Consideration of the vast capital investment required for any contemplated freeway program, however, effects a reasonable hesitation and some anxiety that less costly yet equally adequate alternatives may be overlooked. In many publications, the benefits of "the freeway solution" in easing the metropolitan highway problem have been widely extolled. In some cases, though, these virtues have been cloaked in generalities. The purpose of this discussion is to indicate in a quantitative manner some of the benefits of freeways as contrasted with the effects of two alternative policy approaches.

One hypothetical policy with regard to future travel is to do nothing to improve highway systems in the hope that the public will thereby be forced to make greater use of other "more efficient" modes. At first thought, this appears to be an unrealistic policy; but it has actually been advocated in some quarters and should not be brushed off too quickly. The question is whether people would, as a consequence, give up their cars for some alternate and, presumably, public-operated form of transportation. It is a doubtful consequence. A more likely one is that private automobile travel would continue to grow, and today's peak-hour congestion would become spread over increasingly greater daily time periods. The effect of such a policy, therefore, will be examined here on the assumption that the volume of highway travel would not diminish.

The second alternative to be considered is one of maintaining a level of service comparable to that of today by constructing only arterial, nonfreeway improvements. This is not so hypothetical as the first policy and has more advocates. Because improvements will be designed to keep pace with growth in travel, continued capital investment is implied as well as no worsening of traffic service. At the same time, the policy hints that expenditures will be less and that land required for present or future uses will not be gobbled up for "nonproductive" highway purposes.

The third alternative, of course, is the development of a freeway system as the prime objective of capital expenditure; much less emphasis is placed on arterial improvements.

The effect of such policies can be demonstrated in several ways. The traditional approach of comparing benefits and costs will be considered first, to be followed by an assessment of some other aspects of equal interest.

To set the scene, Figures 1 and 2 illustrate the results of following the two extreme policies. They are drawn from traffic assignment data of the Pittsburgh Area Transportation Study. An idea of the congestion obtained from the "no-improvement" policy can be seen in Figure 1, which shows those arterials whose volumes are more than 1.6 times the practical capacity. For contrast, Figure 2 shows the results after including a freeway system. Substantially, all the high overloads shown on Figure 2 result from the loading of trip volumes at single points on the network (part of the assignment mechanism) rather than from excessive arterial usage in travel between zones. The graphic difference evident in the two illustrations is summarized briefly in Table I, which shows the relation between volumes and capacity for each situation.

In effect, the freeway network has provided sufficient capacity for the incremental growth in travel from 1958 to 1980 and has left the arterial network with a volume of travel approximating present day levels. The superimposed freeway system, shown in Figure 2 and comprising 150 miles of mostly four-lane freeway, was designed in accordance with the "minimum total cost solution,"[1] which is a means of determining the freeway spacing that minimizes the sum of construction cost plus the cost of travel over the system. The network is a preliminary plan only and, while it meets most of the established planning criteria, does not necessarily represent a recommended solution in the Pittsburgh Area.

The traffic assignments from which these data were taken have further usefulness to this discussion. The assign-

1. "The Minimum Cost Solution in Highway Planning," PATS Research Letter, Volume III (March-April, 1961).

TABLE I

Comparison of Volume/Capacity Relationship
Per cent of Total Arterial Mileage

	With No Improvement	With Freeway System	1958 Condition
Volume/Capacity 0-1.0	10.9	43.5	47.5
Volume/Capacity 1.0-2.0	46.9	45.6	45.7
Volume/Capacity 2.0 or more	42.2	10.9	6.8

ment technique used by the Pittsburgh Area Transportation Study provides travel cost estimates for each network tested. These costs consist of time costs for the road users, vehicle operating costs, and accident costs. For interested readers, their derivation may be studied in the reference noted below.[2] The comparisons of travel costs on different systems, which follow, are based on costs per vehicle-mile within the Pittsburgh Study area and are derived from these assignments. In each case, the cost figures represent the total cost of travel to all road users over the entire street and highway network.

The assignment of 1980 trips to the present network provides the travel cost resulting if no improvements are added to the present network. Travel costs for the second alternative are derived from the assumption that 1958 unit travel costs remain the same through 1980. The assignment of 1980 trips to a network incorporating some improved arterials (largely those improvements which have been programmed at this date) and the freeway network provides the cost per vehicle-mile for the third alternative. Vehicle-mile costs for the three situations are summarized in Table II. Total travel costs for the years indicated are also shown.

2. G. Haikalis and H. Joseph, **Economic Evaluation of Traffic Networks** (Chicago Area Transportation Study, 1961), presented at the 40th Annual Meeting of the Highway Research Board, Washington, D. C., 1961.

TABLE II
Travel Costs In Dollars

Year	No Improvement		Arterial Improvement		Freeway Improvement	
	Cost Per Vehicle-Mile	Annual Total (10^6)	Cost Per Vehicle-Mile	Annual Total (10^6)	Cost Per Vehicle-Mile	Annual Total (10^6)
1958	0.1123	347.61	0.1123	347.61	0.1123	347.61
1980	0.1329	722.98	0.1123	610.91	0.0918	499.39
Average Per Year 1958-1980	—	527.59	—	479.26	—	431.16

Assuming a straight-line increase in vehicle-miles of travel and straight-line changes in the unit costs of travel, we have obtained the average figures shown here from the sum of yearly travel costs. Though the savings provided by the improvements of the second and third alternatives are obviously not uniform year by year, when compared with annual travel costs resulting from no improvements, it is felt that the uniform annual figure is reasonable for the purposes of this comparison.

Compared with no improvements, the arterial improvement program would produce average savings in travel costs of 48.33 million dollars per year. The freeway program produces average savings of 96.43 million dollars per year over the same period. While it is quite evident that the freeway improvements lead to more significant savings in travel costs, what about the construction costs in each case?

Cost figures for the added construction and maintenance necessary to provide these savings are perhaps most readily approached by looking at the capacity which each type of improvement must provide. By matching the 1980 vehicle-miles of travel against the capacity of the 1958 network, a deficiency of 7,200,000 vehicle-miles of capacity is found.[3] This is the highway capacity which must be provided across the study area by some means. It is estimated that 3,100,000 vehicle-miles of the total must be provided under urban conditions, and the remaining 4,100,000 mile deficiency will occur in what are now, or will become, "intermediate" areas. It is assumed in

3. A vehicle-mile of capacity is a function of the peak-hour capacity of a network link, the conversion to a daily level, and the length of the link. See **Interim Technical Report Number IV: Measurement of Highway Capacity** (Pittsburgh: PATS, 1960)

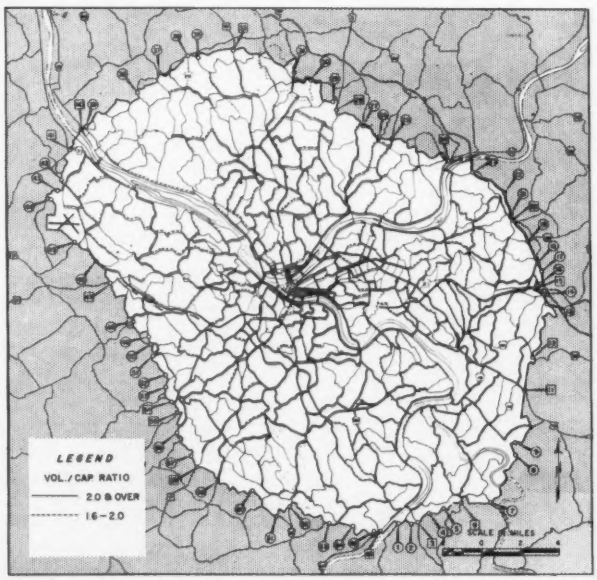


Figure 1

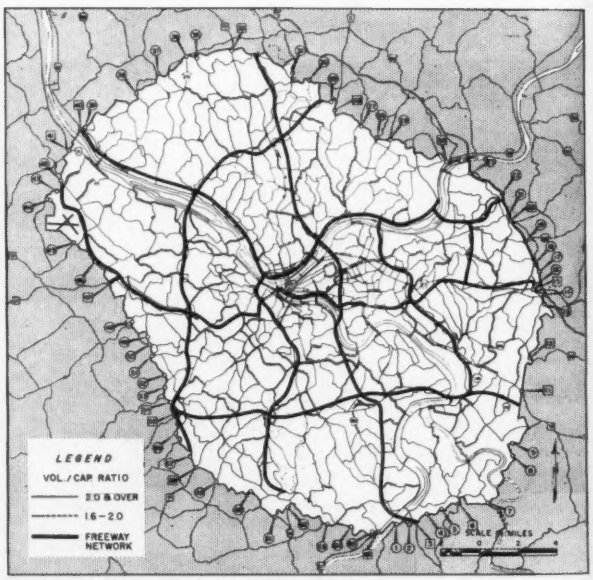


Figure 2

Figure 1 above shows the present arterial street system within the study area (unshaded). If no additional travel facilities are added, the streets shown with red are those that will be operating well over capacity in 1980. Figure 2 shows the same network with a freeway system superimposed. The arterial mileage operating over capacity in 1980 is drastically reduced and the conditions would be susceptible to correction by local traffic engineering improvement.

TABLE III
Arterial Requirements

Route Type	Capacity to be Provided (vehicle-miles)	Mileage Required	Cost Per Mile (10^6)	Total Cost (10^6)
6 Lane Urban	2,000,000	165	$1.2	$198
4 Lane Urban	1,000,000	123	0.9	111
4-6 Lane Widen Urban	100,000	25	1.0	25
6 Lane Intermediate	2,000,000	118	1.0	118
4 Lane Intermediate	1,500,000	133	0.7	93
4-6 Lane Widen Intermediate	600,000	105	0.8	84
TOTAL	—	—	—	$629

the arterial case that part of this capacity will be provided by six-lane arterials; part, by four-lane; part, by widening existing four-lane arterials to six lanes. The relative likelihood of being able to widen streets in urban and intermediate areas and the probable demand for four-lane and six-lane arterials by area were considered, and the deficiency to be made up was proportioned accordingly. Both the mileage necessary to provide the capacity and the ensuing costs are shown in Table III.

The cost figures given are generalized from data provided by the Pennsylvania Department of Highways in the Section 210 Needs Study report *Estimate of Needs for all Road Systems* published in 1958. Right-of-way costs are included. The capacity figures per mile of arterial street needed, to derive the total mileage for each type of route, are the same as those indicated in PATS *Interim Technical Report Number IV*.

For the freeway construction costs, the data from the traffic assignment are again useful as a measure of the adequacy of the sample plan. This assignment, including the freeway network, showed an over-all balance in 1980 of travel and capacity. Table IV presents a summary of the freeway mileage incorporated and a cost estimate based again on Section 210 Needs Study data. Added at the foot of the table is an allowance for arterial improvements which would supplement the freeway network or be required for adequate access or connector routes. This is, admittedly, a rough approximation of system construction costs; but when reduced to a dollars-per-mile base, the estimate is on the high side of more detailed and more accurately derived estimates.

TABLE IV
Freeway Requirements

Freeway Type	New Mileage Provided*	Cost/Mile (10^6)	Total Cost (10^6)
6 Lane Urban	20	$10.0	$200.0
4 Lane Urban	16	5.0	80.0
4 Lane Intermediate	101	3.5	354.0
Total Freeways	—	——	$634.0
	Estimated Arterial Costs		60.0
	GRAND TOTAL		$694.0

*Mileage in addition to existing freeways

TABLE V
Annual Maintenance Costs

Route Type	Cost Per Mile	Type of Improvement: None Miles	None Total Cost (000)	Arterial Miles	Arterial Total Cost (000)	Freeway Miles	Freeway Total Cost (000)
Interstate	$4300	20	$ 86	20	$ 86	90	$ 387
Primary	23	85	196	225	518	95	219
Secondary	1300	430	559	495	643	450	585
Other	800	530	424	660	528	550	440
TOTAL	—	—	$1,265	—	$1,775	—	$1,631

With the use of Schedule C-13 of Pennsylvania's Section 210 Needs Study data and the assumption that about half of the improvements have been completed, estimates of average annual maintenance costs by route type have been made. PATS route types were adjusted to the standard classification on the basis of route characteristics. The annual maintenance costs were then listed by system in Table V.

Compared with the scale of travel and construction costs, it is evident that maintenance cost differentials between the types of improvement are almost negligible. It might even be argued that unit maintenance costs on the unimproved and, therefore, more depreciated system should be higher; thus maintenance costs would be equalized for all three alternatives.

No estimates have been made of salvage value in any of these cases. It is not known what might be considered the present worth of the existing system as a starting point. The two systems incorporating improvements, however, would evidently have higher value than the first alternative. They would be approximately equal since the dollar values of the improvements are reasonably close. Their values in terms of remaining traffic service, also, would be reasonably equal inasmuch as both provide sufficient capacity for 1980 travel but not for further growth. This consideration assuredly deserves some investigation; because of its indeterminate value, however, the question of salvage will not be discussed further in this article.

Two types of improvements, then, have been shown to present different levels of savings in travel cost and different levels of construction and maintenance costs over a system which remains unimproved. For an investment of 629 million dollars, the arterial improvements provide an annual average saving of 47.82 million dollars (travel saving minus maintenance increase). For an investment of 694 million dollars, the freeway system provides annual savings of 96.07 million dollars. A rate-of-return calculation shows approximately 5 per cent for the arterials and 12.8 per cent for the freeways. The same application to the incremental savings and costs of freeways

over arterials shows it to be quite profitable to make the extra investment since the additional savings each year are almost 75 per cent of the added investment. This type of comparison by itself clearly justifies the conclusion that the most economical solution to highway needs is freeway construction.

Another advantage of the freeway solution, all too easily overlooked, lies in its consumption of less land to provide the same highway capacity. This can be demonstrated by using the mileage figures in Tables III & IV. It is necessary to assume average right-of-way widths for the appropriate conditions, and these are indicated in the Table. The widths assumed for freeways are considered to be reasonable, assuming that this mileage is presumably partly elevated, partly depressed, and partly at grade; and not all this mileage will necessarily be designed to the highest Interstate System standards.

The land requirement for the arterial solution is almost twice as much as for the freeway solution. Since the land presently devoted to streets in the PATS study area is 45.52 square miles, the arterial requirements call for an increase of 22 per cent in land converted to this use compared with 11 per cent for the freeway solution. The difference suggests that this is an area which might merit more detailed study with regard to the land planning policy aspects.

One more comparison can be made among the three alternatives. Although it is reflected in the travel cost differentials, the average speed of travel provided by each system makes an interesting comparison in its own right. Speeds on the loaded network are computed in the assignment process by adjusting downward the established initial link speeds as the volume/capacity ratio changes. The results for the "no-improvement" situation and the freeway solution have come from assignments of 1980 trips. The results for the case of arterial improvements are based on 1958 assignments. In each case, the speed is computed as a weighted average based on vehicle-miles of travel on each link in the network.

Average Speed (mph)

Type of Improvement		
None	Arterial	Freeway
19.7	23.4	30.8

To the average road user, the significant differentials which appear here are perhaps more meaningful than a discussion of travel cost savings. They give a sharp emphasis to the difference in levels of service offered by the three alternatives studied.

TABLE VI

Right-of-Way Requirements

Route Type	Right-of-way Required Width (ft.)	Added Route Length (mi.)	Total Land Required (sq. mi.)
ARTERIAL IMPROVEMENTS			
4 Lane Urban	60	123	1.402
6 Lane Urban	100	165	3.119
Widen 4-6 Lane Urban*	20	25	0.095
4 Lane Intermediate	80	133	2.035
6 Lane Intermediate	120	118	2.679
Widen 4-6 Lane Intermediate*	30	105	0.599
Total Arterial	—	—	9.929
FREEWAY IMPROVEMENTS			
4 Lane Urban	150	16	0.454
6 Lane Urban	200	20	0.758
4 Lane Intermediate	175	101	3.343
Allowances for Arterial Improvements			0.600
Total Freeway			5.155

*This is an attempt to average those cases in which no right-of-way would be necessary against those instances in which more would be needed.

The preceding discussion has been based in large part on the current work of the Pittsburgh Area Transportation Study, whose principal objective is the development of major transportation facilities to serve the 1980 travel demand of the Pittsburgh Metropolitan Area. The uniqueness of this and other metropolitan area studies lies in the analysis of entire transportation systems and the determination of total transportation needs and costs. These characteristics make it possible to review the system wide effects of various policies by benefit cost comparisons and by other means as outlined in this discussion. The costs of construction and travel include costs on all highway systems within a given area rather than on a specific single route or on several alternate routes. Such an evaluation, of course, is possible only through the use of computers in assigning traffic to highway networks. With these and the other tools available to the typical metropolitan area study, it can be demonstrated that a freeway system is the only practical solution to the highway planning problem. This does not imply unlimited or uncontrolled freeway construction, nor does it imply that other travel modes should be ignored. A freeway program must be planned in conjunction with mass transportation improvements where conditions warrant and in conjunction with arterial improvements in areas where conditions do not warrant either freeway or mass transportation improvements. But the "freeway solution" cannot be ignored or put on a lower level of priority. It is too clearly evident that the development of freeway systems is the most economical means and the only practical means of providing the highway capacity needed in metropolitan areas.

Alden W. Welch

Alden W. Welch (Affiliate, ITE) died on October 30, 1961. Mr. Welch was research editor for *American City Magazine* and the *Municipal Index*. He was a long-time friend of traffic engineering, having been an Affiliate since 1939.

Providing Increased Protection for Pedestrian School Children

By Walter J. Addison
Chief, Division of Traffic Engineering
Baltimore County, Maryland

THE PROBLEM OF PROVIDING some sort of protection for pedestrian school children when a school is located on a major artery has always been a challenge to those agencies responsible for traffic safety. This problem is frequently complicated in suburban areas when adequate sidewalks are often not provided, and when speeds are greater than would normally be considered safe under these conditions.

In the State of Maryland a reduced speed zone in a school area is not recognized in the Vehicle Code and, as a consequence, the speed limit prevailing on the highway in question is the one in force in the school zone. The standard practice in Maryland as provided for in the *Manual of Traffic Control Devices of the State Roads Commission,* is to place a "School" sign three hundred to five hundred feet from the school buildings on each approach. These signs remain in place during the school season and are removed at the end of the school year. In addition, "School Crossing" signs are placed in advance of a marked crosswalk and they are also removed at the end of the school year. Together with a marked crosswalk, this is the extent to which protection for pedestrian school children is normally provided by traffic control devices.

Under the prevailing practices there has been considerable discussion and correspondence with groups interested in school safety as to the effectiveness of these devices. Numerous requests are received for the installation of traffic signals and school crossing guards to provide further protection. Neither of these "remedies" necessarily completely perform their desired function and frequently may do no good at all in providing protection for school children.

An unwarranted traffic signal may frequently induce a higher accident rate and does nothing to regulate the speed of vehicles, especially those approaching on a green signal. These vehicles are traveling parallel to, and alongside of, pedestrian school children walking along a road with no sidewalks. A school crossing guard basically serves the purpose of holding children by the side of the road until a sufficient gap occurs or, if necessary, stopping traffic to let the children cross in a platoon. The effectiveness of this depends on the advance sight distance of the school guard, the density, and the speed of the traffic flow. In any case, this too does not have any effect on the speed of the vehicles which are passing school children walking in the roadway. In cases of inadequate sight distance, a great hazard may continue to exist to both the guard and the children.

In the past several years a new type of traffic control device has been developed to provide additional protection to pedestrian school children. This device consists of a blank-out, internally-illuminated panel, with a yellow flasher above and below. The entire unit is set in a sign face. This device is put into operation only during the hours when school children are actually on the streets going to or from school and remains inactive during other hours and on weekends and holidays. This is accomplished either by manual operation or an automatic time-clock. Normally this device is intended to display a reduced speed limit on the blank-out panel which would be in effect during specified hours only.

Since a reduced speed limit is not legal in Maryland, the State Roads Commission adopted a variation of this device as a standard and the speed

Figure 1

limit message is replaced by "SLO". Because the size of the blank-out panel is designed to accommodate a two-digit speed limit, the three-letter spelling was used to gain legibility which would be very poor if the proper four-letter spelling was used. The new standard sign, adopted by the Maryland State Roads Commission, is shown in Figure 1. The installation pictured was a pilot test to study the effect of the device and is discussed later in this report.

An installation of this type of device is considerably more expensive than regular school signs and, without a specific reduced speed limit, there was some question as to the effectiveness and hence, the economic desirability of such a device. To find answers to this question, the Baltimore County Division of Traffic Engineering decided to try a pilot study on a school site that presented considerable hazard to school children.

The school in question, the Lutherville Elementary School, is located on

SUMMARY OF SPEED STUDY NO. 1
FRIDAY, AUGUST 14, 1959

	SOUTHBOUND		NORTHBOUND	
	8:00-8:30 A.M.	3:30-4:00 P.M	8:30-9:00 A.M.	3:00-3:30 P.M.
NUMBER OF VEHICLES CHECKED	273	248	224	212
% OVER 40 M.P.H	2.6	3.2	5.8	6.0
% BETWEEN 35-40 M.P.H	23.4	17.3	40.6	29.7
% BETWEEN 30-34 M.P.H	34.3	40.3	24.7	43.4
% BETWEEN 24-29 M.P.H	28.9	34.3	25.8	18.4
% UNDER 24 M.P.H	3.1	4.9	3.1	0.5
MAX. SPEED CHECKED	50 M.P.H	52 M.P.H	46 M.P.H	47 M.P.H
MIN. SPEED CHECKED	16 M.P.H	18 M.P.H	18 M.P.H	23 M.P.H
85 PERCENTILE SPEED	35 M.P.H	36 M.P.H	37 M.P.H	37.5 M.P.H
AVERAGE SPEED	29.9 M.P.H.	30.7 M.P.H	32.3 M.P.H	33.6 M.P.H
% EXCEEDING POSTED LIMIT	48.0	49.6	58.9	72.6

Figure 2
Base Conditions — School closed for summer vacation.

SUMMARY OF SPEED STUDY NO. 2
THURSDAY, OCTOBER 22, 1959

	SOUTHBOUND	NORTHBOUND
	8:45-9:00 A.M.	3:05-3:50 P.M.
NUMBER OF VEHICLES CHECKED	210	447
% OVER 40 M.P.H	4.8	2.7
% BETWEEN 35-40 M.P.H	20.3	13.9
% BETWEEN 30-34 M.P.H	45.3	48.0
% BETWEEN 24-29 M.P.H	21.9	28.2
% UNDER 24 M.P.H	7.7	7.2
MAX. SPEED CHECKED	55 M.P.H.	45 M.P.H.
MIN. SPEED CHECKED	21 M.P.H	20 M.P.H.
85 PERCENTILE SPEED	39 M.P.H.	35 M.P.H
AVERAGE SPEED	31.6 M.P.H	30.1 M.P.H.
% EXCEEDING POSTED LIMIT	60.1	49.9

Figure 3
Standard Conditions — Standard school signs displayed.

SUMMARY OF SPEED STUDY NO. 3
FRIDAY, MAY 20, 1960

	SOUTHBOUND			NORTHBOUND	
	8:15-8:35 AM	2:00-2:30 PM	3:15-3:35 P.M	8:40-9:00 AM	3:40-4:00 P.M
NUMBER OF VEHICLES CHECKED	211	187	165	120	200
% OVER 40 M.P.H	0.0	1.6	0.0	0.0	0.0
% BETWEEN 35-40 M.P.H.	9.5	25.7	5.5	5.0	3.5
% BETWEEN 30-34 M.P.H.	48.8	51.3	20.6	20.0	26.0
% BETWEEN 24-29 M.P.H.	37.0	19.8	64.8	55.8	58.0
% UNDER 24 M.P.H.	4.7	1.6	9.1	19.2	12.5
MAX. SPEED CHECKED	39 M.P.H	43 M.P.H.	40 M.P.H.	35 M.P.H	40 M.P.H.
MIN. SPEED CHECKED	20 M.P.H	19 M.P.H.	16 M.P.H.	18 M.P.H	20 M.P.H.
85 PERCENTILE SPEED	32 M.P.H.	36 M.P.H	30 M.P.H.	32 M.P.H	30 M.P.H.
AVERAGE SPEED	29.8 M.P.H.	32.1 M.P.H	27.6 M.P.H.	26.9 M.P.H	29.5 M.P.H
% EXCEEDING POSTED LIMIT	37.9	62.6	26.1	17.5	27.3

Figure 4
Standard Conditions — Flashing school signal displayed.

Md. Route 45, about two miles north of Towson, Maryland. Maryland Route 45 is the new designation for this road, which is called York Road. Previously the road was marked as U. S. 111 until the U. S. route number was shifted to a new expressway which runs parallel. Traffic volume figures for York Road indicate that the average daily traffic (ADT) volume for 1959 was in excess of 19,000 vehicles per day. The hard surface pavement is approximately twenty-four feet in width with shoulders on each side of varying width and degree of permanent surfacing.

Except for the frontage of the school property facing on York Road, there are no sidewalks or curbs in either direction. The frontage along this road varies from open fields to high, steep banks and from private residences to commercial roadside establishments. Since the Board of Education's policy is that all children who live less than one mile's walking distance to school are not eligible for school bus transportation and there are no public transit facilities available, a large number of children must walk along York Road both in the morning and afternoon without the protection of curbs and sidewalks and in close proximity to heavy traffic, a high percentage of which is composed of trucks.

After the adoption of the new standard for the flashing school warning sign by the State Roads Commission, it was decided to install a pair of these signs approximately five hundred feet in either direction from the main entrance to the school as a pilot study. To test the effectiveness of these devices, comparative speed studies were scheduled under three different types of conditions. The first study was conducted during the summer when school is closed and no school warning signs would be displayed. It was felt that the vehicular flow conditions at that time would be most representative of traffic speeds without the influence of school operation and, hence, school children in the roadway. This established a base speed against which the relative effectiveness of the two types of school warning signs, namely the regular diamond-shaped sign and the flashing sign, could be evaluated. Following the opening of school in the fall, another speed study was conducted with only the standard diamond signs installed. These signs were then replaced with the flashing warning sign and a third study was made.

On August 14, 1959, the first speed study was made. Radar was used to measure the speeds of traffic and separate tabulations were made for both northbound and southbound vehicles during a morning period between 8:00 and 9:00 A.M. and an afternoon period between 3:00 and 4:00 P.M. Summaries of these results are shown in Figure 2. From these summaries it is interesting to note that, based on the eighty-five percentile speed (that speed which 85% of the drivers are driving at or below), the speed limit should be raised to 35 MPH.

Approximately a month and a half after school opened, another speed study was conducted on October 22, 1959. In this case, however, only southbound vehicles were recorded in the morning and northbound vehicles in the afternoon. Summaries of these results are shown in Figure 3. From these figures it would still appear that the speed limit should be raised to 35 MPH. Furthermore, morning southbound traffic appears to have increased its speed in spite of the fact that school is open and children are on the road.

The final study was conducted on May 20, 1960, about one month after the flashing school sign was installed. This was done to allow the traffic to get used to the new device before any reasonable results could be expected from a study. In this study both northbound and southbound vehicles were checked during morning and afternoon periods. In addition, a separate check was made between 2:00 and 2:30 P.M. of southbound vehicles, when the flashing sign was inactive. The positive results of the last study were highly encouraging. During the active periods of the flashing sign, the eighty-five percentile speeds definitely indicated conformance with a 30 MPH limit. Conversely, during the inactive period of the flashing sign the speeds indicate a more realistic limit of 35 MPH. Summaries of this study are shown in Figure 4.

To better illustrate the comparison of data obtained in the three studies, tabulations are summarized in Figure 5 of southbound morning traffic with a bar graph illustrating the speed grouping. In Figure 6 the same operations have been done for northbound afternoon traffic.

During the third study several significant observations were made. With the radar stationed at a point between the two flashing signs, the faces could not be observed to indicate whether the units were operating or not. By watching the speeds recorded on the radar, however, the time at which the units automatically turned themselves on could be noted by the sharp decrease in the speeds. The converse was also true when the units went out of operation, as the speeds noticeably picked up. Obviously, the highly visible nature of these units and the fact that they only operate when necessary has a marked effect on the speed of the traffic flow and are generally well observed in spite of the fact that a specific reduced speed limit is not indicated.

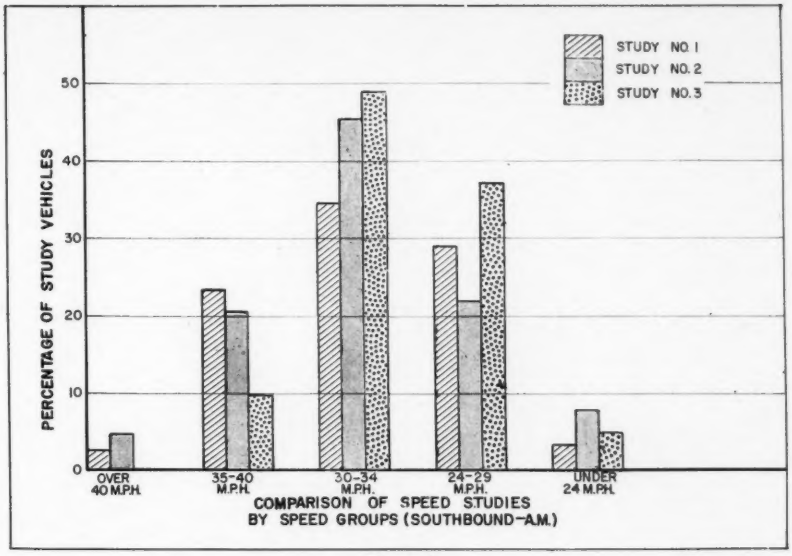


Figure 5

It would appear that several conclusive results have been obtained from this pilot study. The first and most important fact is that it is definitely possible to provide additional and effective protection to pedestrian school children in a school zone. While no specific reduced speed limit was established in this study, a definite lowering of speeds was accomplished merely by indicating a cautionary message. In those areas where a reduced speed limit can be applied, even greater effectiveness can be expected.

Another conclusion reached in this study is that greater compliance to speed lowering devices can be attained when these devices are in use only during the hours they are really needed. The motoring public is apparently will-

(Continued on page 33)

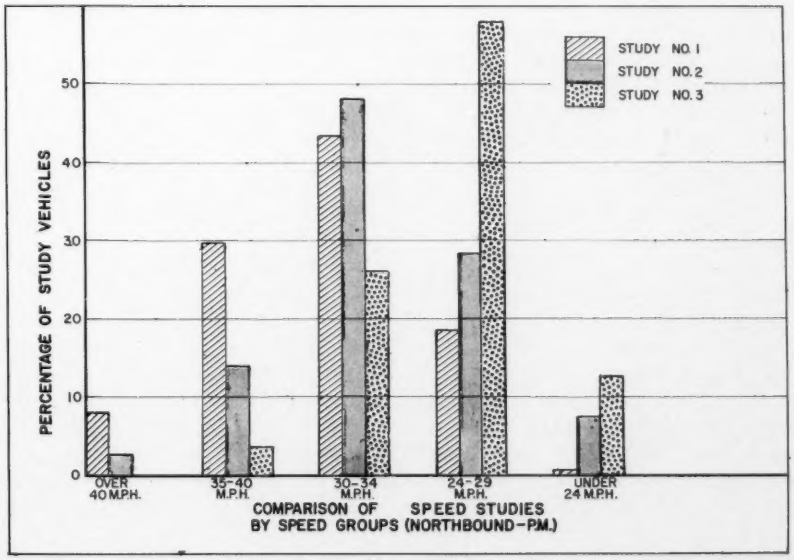


Figure 6

Field Observations for Traffic Flow Model Validation

By Robert P. Shumate
Director of Research
Department of Police Administration
Indiana University

In recent years there has been a growing enthusiasm on the part of many workers to quantify traffic flow behavior through the construction of mathematical models. This approach appears to hold genuine promise for better understanding of the complex phenomena of traffic flow. Numerous models or partial models have been constructed expressing relationships in many terms. At one time or another, queue theory, simple arithmetic, algebra, differential equations, and probability functions have been used. These mathematical languages are not mutually exclusive, since there is nothing that can be said only in a single mode. Typically, the mode of expression reflects the elements being explored, as well as the capabilities of the author.

The purpose of model building has in general been the same. It is to provide a structural framework within which the operation of relevant complex phenomena can be understood. In the case of traffic flow, model building has the additional purpose of quantifying the complex social phenomena involved so that hypotheses involving these phenomena may be stated in a manner that will permit testing by empirical means.

A satisfactory model must have a number of characteristics. It must be based upon valid assumptions concerning certain variables that, on the average, remain constant or change very slowly over time. It must have high predictive power of such a nature that questions may be asked concerning, "what will happen if things are changed in this specific way?" Most important, models must be subject to testing against empirical data. A model, no matter how elegantly constructed in mathematical terms, remains a hypothesis until it is validated against observations obtained from the real world.

Unfortunately the models presented in the recent literature reflect no attempt to assess the degree to which the models resemble the real world. Little has been accomplished toward the development of methods for validating traffic flow models. What validation has been carried out has been for the most part fragmentary and limited to one or a few elements. The problem of model validation is by no means a simple one. Frequently the establishment of criteria for validation and the design of sampling methods to obtain validating data is a more difficult task than the actual construction of the model itself. Equally as perplexing are the technical problems of obtaining measurements of the specific elements in the traffic stream required for validation.

Most model building in the traffic field has proceeded from the assumption that individual behavioral elements can be satisfactorily described in the microcosm. What is taken to be unknown is the manner in which the individual elements interact in the system as a whole. The model purports to describe the manner in which these interactions occur. All such models have one thing in common which should properly be the basis for empirical validation. They generate behavioral elements not explicitly considered in the original set of assumptions. These generated elements must then be compared with observed data obtained from actual traffic flow to determine whether the agreement achieved is more than mere coincidence.

This suggests that if large-scale attempts are to be made to validate the generated output of theoretical models with observed data, some method for economically and efficiently measuring a wide range of detailed behavioral elements that occur in the traffic stream must be developed. The list of specific behavioral elements that can be defined is extensive, and in any given case will reflect individual interests and the mode of expression utilized in the model. The one general limitation which applies is that the elements selected must be such that their measurement can be expressed in quantifiable terms.

In January, 1960, the author and his associates began a study into the effect of police enforcement on driving behavior, under a grant provided by the U. S. Public Health Service. A part of the study involved the construction of flow behavior models for a variety of highway configurations. We were vitally concerned with the problem of validating our theoretical models, and for this reason a considerable portion of the work during the first year was directed toward developing instruments and techniques for measuring traffic flow behavior.

At the outset we had no prior knowledge of the behavioral elements that might prove to be important. For this reason the approach was one of developing instruments and techniques that would record a wide variety of behavioral elements simultaneously for later recovery as needed.

After considerable preliminary testing, a Coleman-Beattie 35 mm single frame rapid advance camera was selected as the basic unit around which to build the "instrument package." A number of minor modifications were made in the film-advance mechanism

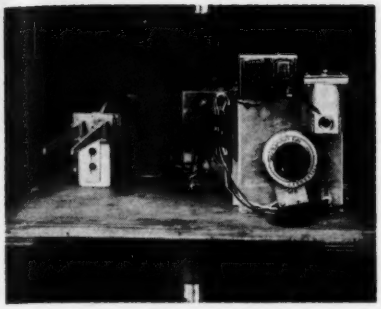


Figure 1
Front view of the camera and radar sensing unit showing the solenoid and lense board.

and the shutter to strengthen them for continuous operation. An Ilex f/1.9, 75 mm lens with an automatic self-cocking shutter was selected to permit work under difficult light conditions. Shutter speeds range from "Time" to 1/250 of a second, with the focus fixed at 130 feet, providing a depth of field from 25 feet to infinity at f/11. Daylight loading of film by interchangeable cartridges is provided to permit film changing in the field without special facilities. Each cartridge has a capacity of 1600 frames and the camera is equipped with a visual frame counter to permit checking at a glance the film already used.

Shutter operation is controlled by a slow-moving D. C. solenoid mounted on the lens board. The solenoid is mounted in an inverted position to provide for gravity return and cleaner operation, and is directly linked to the shutter. The solenoid is activated by a tripping mechanism normally placed 150 feet from the instruments. The tripping mechanism consists of two parts:

1. A 1/8" neutral-colored tube stretched across the highway.
2. A discriminator switch located on the shoulder of the highway which transforms the pneumatic pressure generated by the tube into an electrical impulse that activates the solenoid.

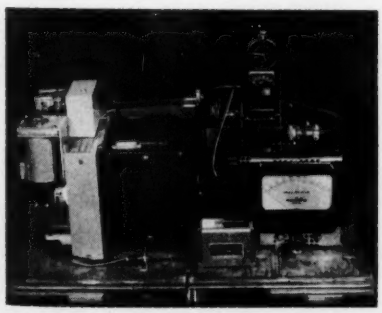


Figure 2
Side view of instruments showing from left to right; camera, film chamber, frame counter, and external meter. At the upper right the data chamber is displayed.

The sensitivity adjustment for the pneumatic pressure ranges from 1/4" of water to 10" of water. The discriminator switch, which is self-powered by a 45-volt dry cell battery is designed to discriminate against the rear wheels of vehicles by remaining inactive for a short period of time after receiving and transmitting an impulse. The time base is arbitrarily set to discriminate against vehicles traveling twenty miles or more per hour. However, as the frequency of triggering increases, the time base automatically shortens to insure that no vehicles are missed. All components are housed in a case 6" x 4" x 4".

The camera contains a chamber for the purpose of photographing data generated from different sources onto each frame of the film. The information in the data chamber is transmitted to the film by means of a periscope system utilizing an f/1.9 lens. Exposure time is controlled by impulsing a pair of high speed 110-volt lamps in the data chamber through a microswitch connected to the main shutter solenoid. The pulse length is adjustable to correct for proper exposure.

Two items of information are photographed on each frame by this method:

1. The speed of the vehicle.
2. The time of the exposure.

The speed is obtained from a transistorized radar sensing unit mounted next to and parallel with the camera itself. The sensing unit is connected to a meter, calibrated in miles per hour, located in the data chamber. At the moment the shutter is tripped, the face of the meter is photographed onto the upper left side of the film. The angle of the sensing unit is adjustable to insure that it records true speed at the moment of shutter activation, while special anti-bounce circuitry minimizes the needle swing. As a means of conveniently calibrating the radar unit, it is connected to an external speed meter that can be activated with a toggle switch. In addition to the speed meter, the data chamber contains a clock calibrated in twenty-four hour time units with a sweep second hand. Each time the shutter is activated, the face of the clock is photographed on the left side of the frame just below the speed meter.

The entire instrument package is mounted on a flat base board of plywood attached by a sleeve arrangement to an aluminum tube four feet in length and three inches in diameter. The aluminum tubing is designed to fit into a box four feet long, two and one-half feet deep. The base contains the power supply and a transformer to convert battery current to 110 volt alternating current. The wire from the discriminator switch enters through a plug at the side of the base box, and all connecting wiring from the power supply to the instruments themselves are wired through the hollow center of the upright aluminum post.

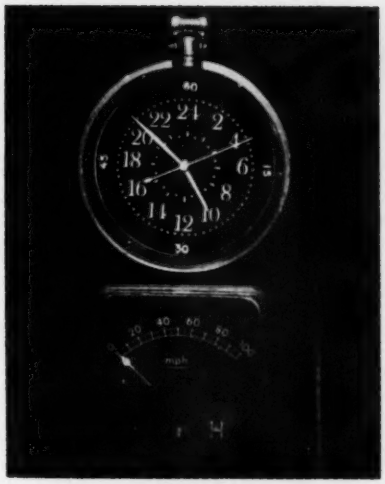


Figure 3
An enlargement of the data chamber as it appears on the frame of each film.

To make the entire instrument configuration as inconspicuous as possible, a hood designed to look like a mailbox is placed over the camera and radar unit. The covering is of Royalite plastic and is detachable for ease of calibrating and servicing the instruments. The entire unit can be set up or disassembled in about twenty minutes, and two complete units can be carried in the rear of a station wagon.

The camera and its associated equipment operate on 110-volt A.C. The radar unit operates from 12-volt D.C. The power supply itself consists of two 12-volt storage batteries in parallel providing for two hours of continuous operation with no loss in reliability. Conversion of power from 12-volt D.C. to 110-volt A.C. is by means of a 100-watt D.C. to A.C. converter located in the base.

Operation of the instruments is controlled by a switching net which sequentially, in an interlocked manner, simultaneously distributes the signal from the road tube through the pulse discriminator to the data chamber and

the solenoid. After the solenoid stroke is complete, the signal is switched to the film advance mechanism. After the film advance is complete, the interlocks are released and the system is ready to accept a new impulse. The minimum time from trigger impulse to interlock release is 0.25 seconds.

Field Procedures

The measurements taken by a single instrument provide a large amount of information about vehicle behavior at a given point in space over some period of time. A far more useful set of measures can be obtained by securing information about traffic behavior as it occurs over space as well as time. By utilizing the instruments in pairs, it is possible to reconstruct the flow of traffic over a given segment of highway and measure the occurrence of behavioral elements generated throughout the segment.

To make the instruments compatible for use in pairs, the clocks are especially built and calibrated in pairs to minimize deviation between them. The average deviation of the paired clocks under field conditions has been found to be less than one second for each two hours of operation. In use, the instruments are placed a known distance apart, which may be any convenient interval to be sampled. Thus, all vehicles entering and leaving the segment are photographed, and the exact times of their entry and exit, as well as their spot speeds, is recorded. Implicit within this information is the time ordered sequence in which each vehicle entered and left the segment.

To ensure reliability of sample measurements, a series of standard checks is followed. A written check list has been developed for this purpose that is completed for each sample and transmitted with the exposed film. The checking procedures are:

1. The radar unit of each instrument is calibrated at the beginning and end of each sample with a calibrating tuning fork. The actual readings are noted on the check sheet.

2. The clocks are removed from the data chamber and synchronized at the beginning of each sampling period. At the conclusion of the sample, the clocks are again removed and any deviation noted.

3. At the start and ending of each sample period, a test car is driven through at a known speed.

4. Voltage in various parts of the system is checked by means of a permanently mounted external meter at the start and end of each sample period.

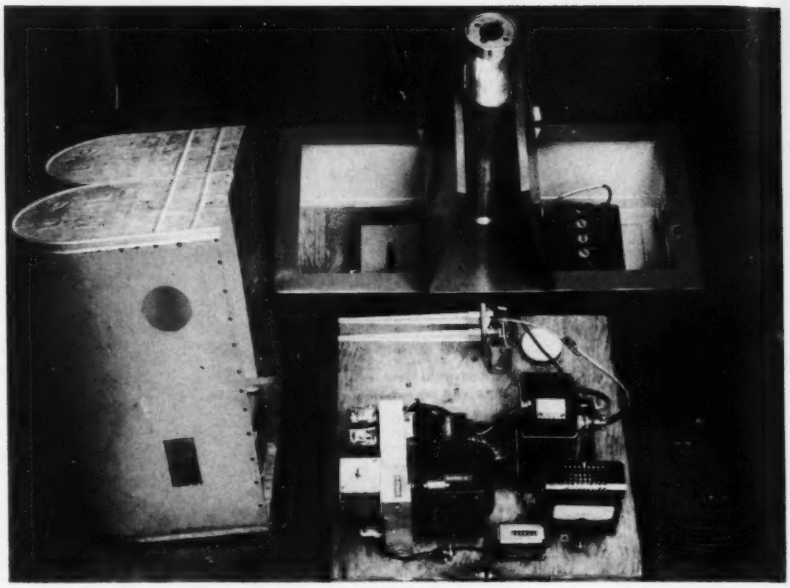


Figure 4
Display of all accessories including hood, instruments, discriminator switch with the base box in the background.

A pair of instruments, including accessory equipment such as extra storage batteries, road tubes, and spare parts, can be carried conveniently in a standard model station wagon. We have been using a 1960 Chevrolet station wagon with a pair of specially built racks to transport the instruments. The station wagon is equipped with a Stewart Warner survey speedometer which measures miles to the nearest 1/1000 of a mile to insure accuracy in spacing the instruments. The only other modification was the installation of a heavy-duty generator with a power outlet inside the wagon to permit charging of batteries in the field.

Data Reduction and Processing

At the conclusion of the sampling period, the film is removed from each camera, suitably identified and mailed to a central location for processing. Two Remington Rand microfilm viewers are used for reducing the data to usable form. All vehicles moving in one direction are processed first, then the film is re-run and vehicles moving in the opposite direction are processed. The method of reducing data is as follows:

The films from the two cameras are placed in separate viewers. The first vehicle that entered the sample space in viewer number one is located. The operator then turns to the second viewer and locates the same car as it left the sample segment. When the vehicle is matched at the two points, the operator records the following information on a coding sheet:

1. Time of entry in hours, minutes and seconds.
2. Time of exit in hours, minutes and seconds.
3. Spot speed at time of entry.
4. Spot speed at time of exit.
5. Coded information concerning the position of the vehicle on the road at entry and exit points.

The operator then moves to succeeding vehicles in viewer number one and

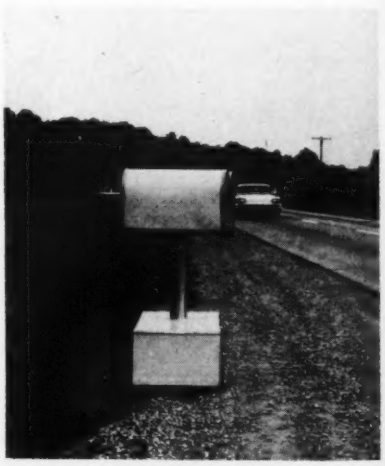


Figure 5
Typical instrument set up adjacent to a two lane rural highway.

repeats the process until the sample is complete. There has been little difficulty identifying vehicles at the two points. The pictorial detail is sufficiently clear that they usually are identified by comparing make, model, and distinguishing marks. As an additional check, license plate numbers are identifiable in most cases. The data thus obtained are punched into IBM cards, one vehicle to a card. The card is constructed as follows:

Card Column	*Data*
1	Type of vehicle
2-4	Sequence in
5-7	Sequence out
8-13	Time in
14-15	Speed in
16-18	Position on highway in
19-24	Time out
25-26	Speed out
27-29	Position on highway out
30	Direction of travel
31-33	Length of sample segment
34-36	Sample number

A program has been written for the IBM 650 computer to process the data and extract selected information. When the sample is ready for processing the cards representing the vehicles are read into the computer memory. Each vehicle is represented in the computer memory as a twenty-digit number which specifies the times of entry and exit from the sample, the spot speed, and the time-sequence order in and out. The program will accept up to 700 vehicles at one time, and assigns vehicles positions in a waiting area in the time-ordered sequence in which they actually entered the segment. When the waiting area is filled, or all the vehicles for the sample are entered, each vehicle is computationally passed through the segment. The type of information recorded depends upon the study subroutines being used, which are under control of the operator.

Since the inception of the program, study subroutines providing the following information have been written and tested:

1. The headway in both feet and seconds of each vehicle as it enters and leaves the segment.

2. The travel time of each vehicle through the segment.

3. The travel speed of each vehicle through the segment.

4. The number of seconds there were N vehicles in the segment.

5. The number of overtakings and passings.

6. Cumulative distributions of 1-4 above.

Several optional output formats are available under program control. All outputs are in the form either of numerical listings or cumulative distributions. A typical output format used for studying queue formation and decay is shown in Table I.

These measures are by no means exhaustive. They merely reflect our particular interests at the moment. We are currently working on subroutines that will compute the numbers of vehicles which passed 1, 2, 3 . . .n cars and the number of vehicles passed by 1, 2, 3, . . .n cars. We are also programming a subroutine that will compute the number of head-on meetings that take place in the segment.

One of the present limitations on the study routines that can be used is the size and operating speed of the IBM 650. With sufficient speed and memory capacity, it is possible to extend the processing to such things as the amount of delay each vehicle encounters due to queueing produced by speed differentials. It would also be possible to examine the effect of gaps in the opposing traffic stream on both passing interaction and queueing. We are now making plans to re-program for an IBM 709 computer which will permit a greater versatility in dealing with the data.

Table I

Seq in	Headway in	Speed in	Seq Out	Headway Out	Speed Out	Travel Speed
001	9	53	002	4	48	50.2
002	14	67	001	22	64	62.7
003	1	41	003	21	43	40.7
004	1	42	004	2	42	40.9
005	6	59	005	1	44	44.8
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
226	2	38	224	16	61	54.7

General Appraisal

The instruments and processing methods discussed have been in use for slightly more than six months. During that time, over 50,000 individual observations have been made and processed. We feel in general that the instruments have proved their worth, although there are still a number of problems that have not been completely solved.

During the early phases of our field work, as might be expected, there were frequent failures of various instrument components. Continuous modification has at present all but eliminated these problems and we have reduced mechanical and electrical failure to a minimum.

Perhaps the biggest drawback is the high cost per observation of obtaining and processing data. Based on our experience to date, it is costing, on the average, 11 1/2 cents for each observation. This includes cost of collection in the field, films and film processing, data reduction, and computations. This high cost is somewhat offset by the fact that each observation yields a large amount of information.

Our work with the instruments has been limited to two-lane rural highways, with volumes ranging from 75 to 650 cars per hour. They have performed well within this range of traffic densities. The one component which tends toward unreliability at higher densities is the radar unit. The ability of the radar unit to discriminate between vehicles decreases as traffic densities in both directions become high. At volume levels in excess of 600 cars per hour, the number of vehicles whose spot speed cannot be determined due to other vehicles entering the beam is quite high. We are currently exploring an alternate method of recording spot speeds that will permit work at higher densities.

The data that have been collected have more than proved their value. As a means of validating formal traffic flow models, they have exceeded our initial expectation. The availability of data in such a form permits realistic comparison of the generated results of theoretical models with what actually occurs under real traffic conditions. We fully expect that further refinements in both the instruments and the data reduction and processing methods will occur as our experience grows.

Cross Median Accident Experience On New Jersey's Garden State Parkway

By Melvin J. Kohn
Assistant to Executive Director
Garden State Parkway

THE GARDEN STATE PARKWAY traverses the entire State of New Jersey, spanning the 173 miles from the City of Cape May on the southern end to the New York State Line near Spring Valley. Although essentially a barrier-type toll facility, the Parkway includes many toll-free portions for local travel, and actually construction as a toll-free project was started in 1946.

Approximately 20 miles in three widely separated sections were built by the State Highway Department with public funds and they remain toll-free under the department's jurisdiction. One such four-mile section has 13 crossings at grade.

The State Legislature in 1952 created the New Jersey Highway Authority and directed it to complete the Parkway as a toll facility. The entire basic route was completed July 1, 1955, and the feeder road to the New York Thruway on July 3, 1957, thereby completing the $330,000,000 project.

By legislation, use of the Parkway by trucks is limited to the southern 90 miles. Passenger vehicles comprise almost 99 per cent of total traffic.

The route consists of approximately 56 miles of six-lane divided highway, 116 miles of four-lane divided, and a one-mile two lane crossing of Great Egg Harbor in Cape May County. The original design, wherever possible, utilized wide medians ranging up to 600 feet and retained much of the natural landscaping.

In many locations where, because of land acquisition limitations, the median is relatively narrow, extensive use was made of guardrail and earth mounds. These design features have resulted in a comparatively low number of cross-median accidents. Cross-median accidents are defined for the purposes of this study as any accident in which one or more vehicles departed

TABLE I
Garden State Parkway Accident Statistics
1957 through 1960

	1957	1958	1959	1960	Total 1957 Through 1960
Total Accidents*	942	959	1,045	1,114	4,060
Accidents/100 MVM	89.9	87.3	86.2	86.7	87.4
Injury Accidents	304	345	365	381	1,395
Injuries	561	603	667	632	2,463
Injuries/100 MVM	53.5	54.9	55.0	49.2	53.0
Fatal Accidents	14	13	24	10	61
Fatalities	19	15	26	13	73
Fatalities/100 MVM	1.81	1.36	2.14	1.01	1.57
Vehicle Miles in Millions	1,048	1,099	1,212	1,285	4,644

*All accidents are included, regardless of amount of damage.

TABLE II
Cross Median Accidents By Month, Hour, Day
1957 - 1960

Month	No.	Month	No.
January	5	August	6
February	4	September	7
March	4	October	4
April	1	November	8
May	5	December	5
June	7		—
July	7	Total	63

Hour	No.	Hour	No.	Hour	No.
12M-1AM	3	8-9 AM	2	4-5 PM	8
1-2	4	9-10	3	5-6	4
2-3	3	10-11	3	6-7	3
3-4	1	11-12N	2	7-8	3
4-5	1	12N-1PM	2	8-9	2
5-6	1	1-2	2	9-10	1
6-7	0	2-3	2	10-11	3
7-8	4	3-4	4	11-12M	1
					—
				Total	63

Day	No.	Day	No.
Monday	4	Friday	12
Tuesday	10	Saturday	11
Wednesday	4	Sunday	17
Thursday	5	Total	63

from one roadway, crossed the median, and either partially or completely, entered the roadway in the opposite direction of travel.

This study summarizes the cross-median accident experience during the four-year period from 1957 to 1960, inclusive. Accident data was taken from the official State Police reports and includes every incident regardless of the dollar amount of damage.

To permit evaluation of the cross-median accident problem, overall accident figures have been included. Table I shows Parkway accident statistics for the four study years.

Accident Data

During the four-year period, the Parkway experienced 63 accidents that involved crossing of the median area from one direction of travel to the opposite direction. Cross-median accidents constituted 1.6 per cent of the 4,060 accidents of all types that occurred during the same period.

Of the 61 fatal accidents during the four years, three, or 4.9 per cent, involved crossing of the median, and two of the three resulted from head-on collisions. The three fatal cross-median accidents resulted in three deaths, or 4.1 per cent of the 73 persons killed during the four years. In addition, 70 persons were injured in 35 personal injury accidents.

Table II indicates the occurrence of these accidents by month, day and hour. There is no clearly defined relationship between the number of occurrences and the peak traffic months of the summer period. In fact, a substantial number of accidents occurred under bad weather or road conditions during the winter months. However, it appears that the peak hour and weekend days experienced a disproportionate share of this type accident.

Table III shows the lighting, weather and roadway conditions that existed when the cross-median accidents occurred.

Table IV shows the major causes of the cross-median accidents, tabulated by the number of vehicles involved.

Over 44 per cent of the accidents were of the single vehicle type. Of the multiple-vehicle accidents, 14 involved cars traveling in the same direction. In these cases, one of the drivers lost control and traversed the median into the opposite roadway. In two instances, each involving three cars, the initial collision was between two cars traveling in the same direction and the second impact occurred on the opposite roadway. The other 19 multiple-vehicle accidents involved collisions between vehicles traveling in opposite directions.

Most of the cross-median accidents occurred in a few general areas, with the balance taking place at various locations in every section of the Parkway, as shown on Table V.

Over 60 per cent of the cross-median occurrences happened in two of the three state sections. The worst general area was from Milepost 138.3 to 139.0 where the Parkway is on a long viaduct over the tracks of the Lehigh Valley and Central Railroads and N. J. Route 28. The median width is about three feet, consisting of raised concrete having eight inch vertical curbs. During the study period, 16 accidents involved crossing of this median. When the road has been plowed and snow

TABLE III

LIGHTING	NO.	WEATHER-ROAD	NO.
Daylight	36	Clear—Dry	51
Dawn or Dusk	1	Clear—Snow	1
Dark without overhead lights	18	Snow—Snow	1
Dark with overhead lights	8	Rain—Wet	6
	—	Rain—Ice	1
Total	63	Snow—Ice	3
		Total	63

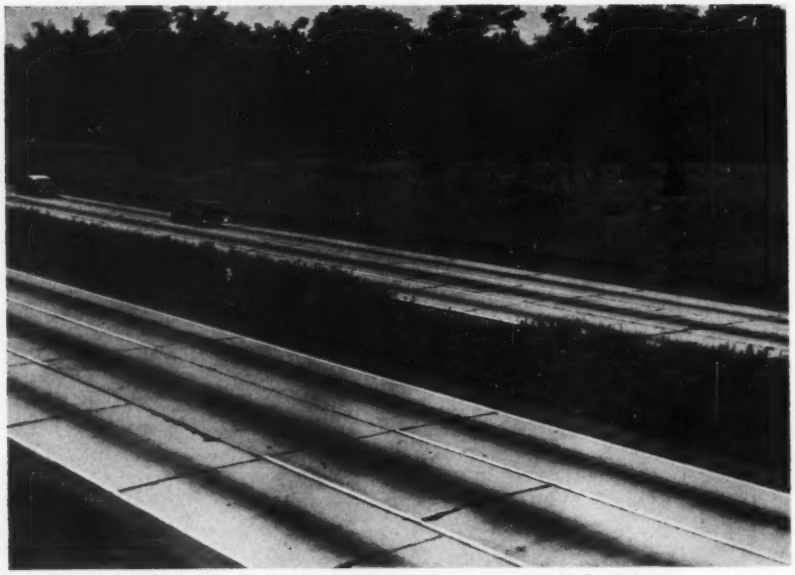
TABLE IV

CAUSE	NUMBER OF VEHICLES ONE	TWO	THREE	FOUR	FIVE	TOTAL NO. ACCIDENTS
Ran off Roadway	13	7	2	1		23
Skid	5	4			1	10
Sleep	6	1				7
Miscellaneous		5	1	1		7
Rear End Collision		3	3			6
Cut-off		2	2			4
Physical Ills	2	1				3
Blow-out	1	1				2
Drunk	1					1
Totals	28	24	8	2	1	63

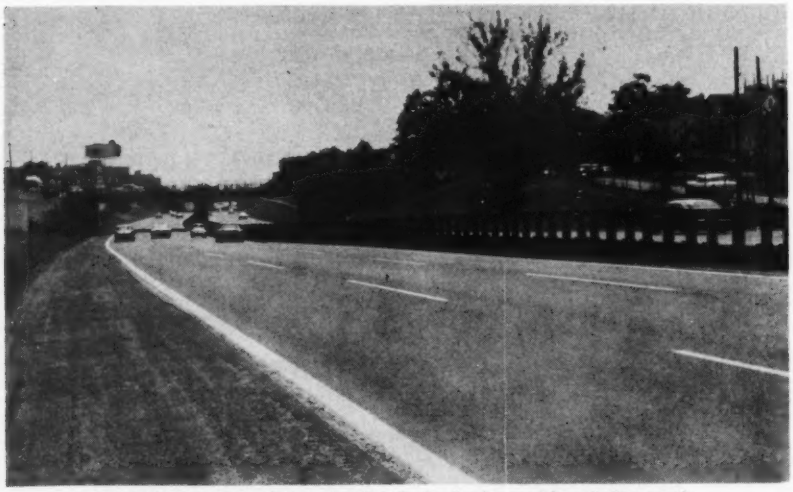
TABLE V
Cross Median Accidents
Type of Median

Area	Type of Median	No. of Acc.	
Great Egg Harbor Bridge	None		5
State section—Toms River	40′ Grass		3*
State section—Union	Mound	14	
	Grass—Various widths	5	
	Raised concrete, 3′ wide	16	35
Union—Essex Plazas	Grass—Various widths	6**	
	Wooden Barrier Fence	4	
	Raised concrete, 3′ wide	1	
	Cones of Toll Plaza	1	12
Raritan River Bridge	Raised concrete or steel		2
Other areas	Grass	5	
	Raised concrete, 3′ wide	1	6
	Total		63

*Includes 1 Fatal Accident
**Includes 2 Fatal Accidents



A view of the earth barrier showing the intermittent breaks for drainage.



The Parkway in Essex County showing the barrier fence with anti-glare panels.

State section showing the raised concrete median.

pushed against the curbs, the hard-packed snow forms an incline that increases the ability of vehicles to mount and cross the median. The 1960 two-direction AADT in this area was estimated to be 79,000.

The area that had the second highest number of crossings was the state section having the earth mound in the median. The state, in 1956, installed approximately 11.7 miles of median mound. The typical mounded section has a height of four feet above the edge of pavement. On super-elevated sections, the height varies, and in some cases where timber guardrail was used in conjunction with the mound, the height was only 2.5 feet. The slope of the mound in all cases was 2:1. During the four-year study period, of 78 vehicles hitting the mound, 25 turned over and 14 crossed into the opposite roadway. In other words, 50 per cent of the accidents involving the mound had undesirable results. In another five accidents, after hitting the mound, the vehicles returned to the roadway and were involved in collisions with other cars. It is indicated, therefore, that the existing earth mound is not a satisfactory form of median barrier, not only from a safety standpoint, but also considering operations. Although reducing headlight glare, the mound also decreases the maximum use of police patrols. With other types of barriers, a patrol can actually see both roadways during a tour of duty; with the mound, the officer's vision is restricted to one direction only. Maintenance of the earth barrier is not always easy. The 1960 AADT (two-direction) in the mound areas varied from 40,000 to 84,000.

The two-lane Great Egg Harbor Bridge, causeways and approaches experienced five cross-median accidents. Separation of opposing traffic is accomplished only by a double white line. The posted lower speed limits have undoubtedly contributed to reduced severity of accidents at this location. Methods of improving lane separation are being studied. In the meantime, reflective plastic buttons are being fastened with epoxy to the bridge deck in the space between the two white lines.

Other vehicles crossed the median at locations such as: between the end of the median fence and an abutment; in the opening between fence sections; narrow raised concrete medians on

(Continued on page 44)

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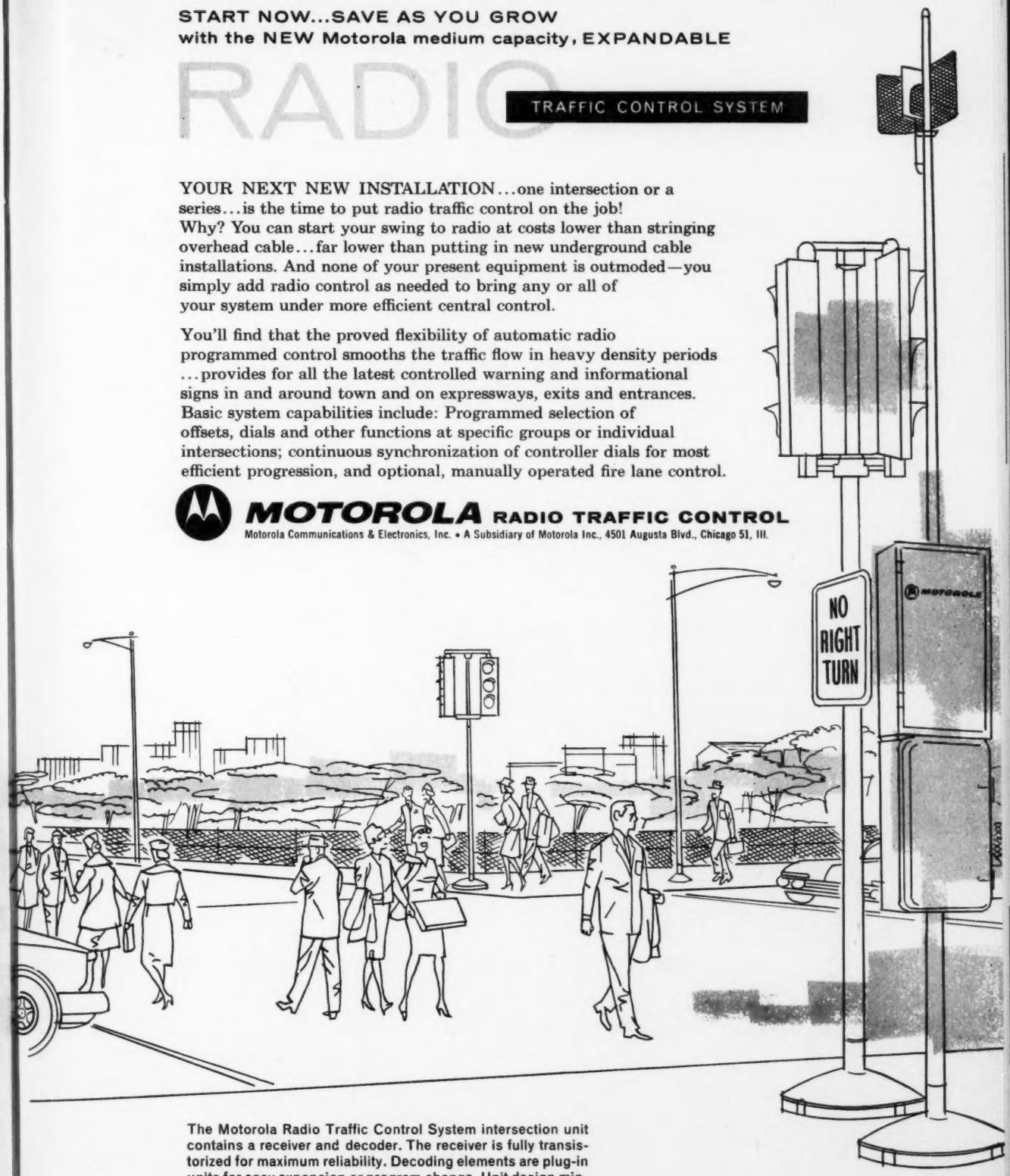

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Traffic News

Office of Transportation Set Up in HHFA

The Federal Housing Administrator has announced the establishment of an Office of Transportation in the Housing and Home Finance Agency to carry out the mass transportation provisions of the Housing Act of 1961. Professor John C. Kohl of the University of Michigan has been appointed to head the new office.

The office of Transportation will be responsible for administration of the mass transportation demonstration grant program and of the transportation facility loans program provided under the recently-enacted Housing Act of 1961. It will also be responsible for providing assistance to the Urban Renewal Administration in administering those phases of urban planning assistance that relate to urban transportation, and to the Community Facilities Administration in administering its program of advances for public works planning when such advances pertain to the planning of transportation facilities and equipment.

Just prior to its recent adjournment Congress appropriated $42,500,000 to initiate the demonstration grant program and the transportation facility loan program.

For the past nine years Prof. Kohl has been Director of the Transportation Institute of the University of Michigan. As such he was in charge of project research and educational programs in transportation and related areas with a staff of up to 35 persons.

During that same period he also served as professor of Civil Engineering (the last six years) and associate professor before that. He has been at the University since 1946.

Professor Kohl has been active in work of the American Society of Civil Engineers and the Highway Research Board and is well known in the traffic engineering field. Very recently he received an award from the University of Michigan for "his authoritative judgment in traffic problems, which is sought throughout the Nation."

Boston Traffic Changes Recommended by ASF Report

Consolidation of Boston's street transportation functions under a three-man Public Improvement Commission to improve traffic management and coordinate it with redevelopment activities has been recommended to the city by the Automotive Safety Foundation in a report just released.

The city also was advised to abolish its present Traffic Commission and transfer its duties to a new Commissioner of Traffic and Parking who would have broadened responsibilities, including control of off-street parking and street lighting.

The commissioner would be a member of the Public Improvement Commission along with the public works commissioner and the development administrator, who heads the redevelopment program.

The recommendations were presented to Mayor John F. Collins recently after an eight-months' study of the city's street and traffic management functions by the Foundation's Traffic Engineering Division, directed by D. Grant Mickle. Carlton C. Robinson was study supervisor.

Legal steps to implement the recommendations were outlined by the Foundation's Laws Division, which is now studying the city's traffic regulations for comparison with the Model Traffic Ordinance, a nationally-accepted standard for cities.

One of Boston's major needs, according to the report, is increased emphasis on transportation planning with a larger planning staff which can develop a sound traffic program on a long-range basis.

Legislation to permit the reasonable regulation of pedestrians was recommended.

City officials also were advised to modernize traffic signals to permit more efficient traffic movement. The changes should conform to state standards, the Foundation said, but the city should be exempt by legislation from the present requirement to obtain state approval for individual traffic controls.

The city was urged to provide more effective curb parking control by the use of a variety of time limits for parking rather than the present uniform two-hour limit.

The Foundation said the reorganization would add less than 15 per cent to the city's personal services budget since the new professional grades would be offset by a decrease in supervisory and skilled labor grades.

Single copies of the report may be obtained from the Foundation headquarters, 200 Ring Building, Washington 6, D. C.

The Foundation, a non-profit research organization supported by more than 600 companies and industry associations, has made similar studies in Detroit, Los Angeles and San Francisco.

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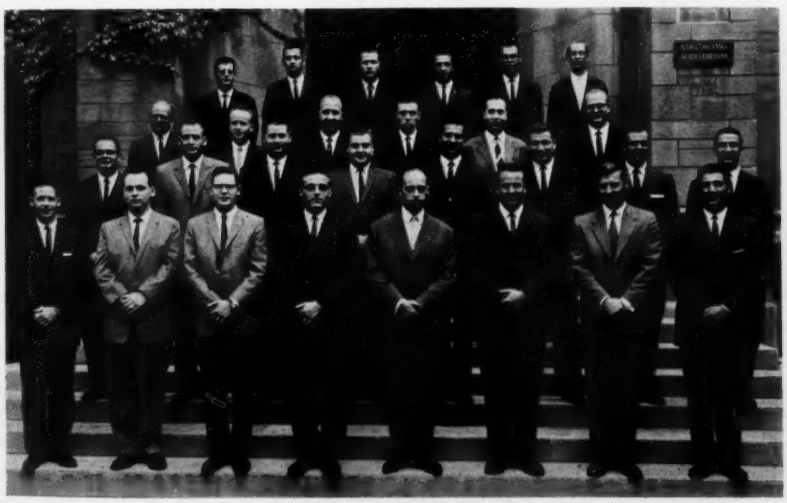
Yale Bureau Enrolls Class of 29 Students

The Yale Bureau of Highway Traffic has enrolled for the 1961-1962 year a class of twenty-nine men, including three from overseas.

The class consists of the following:

Leland H. Bates, St. Louis Traffic Division; Bertie Beukers, Delft, Holland; James W. Boring, San Jose (Calif.) Department of Public Works; Phillippe Henri Bovy, Lausanne-Ouchy, Switzerland; James L. Brown, Texas Highway Department; Richard E. Bunyan, Kentucky Department of Highways; Charles C. Crevo, Connecticut Highway Department; John A. Finguerra, Tippetts-Abbett-McCarthy-Stratton, New York; Robert W. Gubala, Connecticut Highway Department; David W. Gwynn, Virginia Department of Highways; Howard C. Hanna, Bureau of Public Roads; Robert G. Holsinger, Downey (Calif.) Department of Public Works; Arthur F. Hourihan, Connecticut Highway Department.

Also: Zvonimir Jelinovic, Zagreb, Yugoslavia; Robert Kochanowski, Pennsylvania Department of Highways; James M. Main, DeLeuw Cather & Co. of Canada, Ottawa; Peter A. Mayer, Arizona Highway Department; James Mazzaferro, New York City Department of Traffic; Henry J. Ney, New Jersey Bureau of Traffic Safety; Henry L. Peyrebrune, Illinois Division of Highways; Arthur W. Roberts, New York City Department of Traffic; Lawrence Rogow, Hamden, Conn.; James B. Rushing, D. C. Department of Highways and Traffic; Kenneth R. Seiler, Spokane Traffic Engineering Division; Edward H. Small, Jr., Garden City (N. Y.) Engineering Office; Theodore J. Soltman, Woodmont, Conn.; George T. Tucker, Vermont State Highway Department; Richard J. Warchol, New Jersey State Highway Department; Robert Wortman, New Mexico Highway Department.



Yale Bureau of Highway Traffic
Row 4—Bovy, Kochanowski, Gwyn, Crevo, Warchol, Bunyan; Row 3—Bates, Hourihan, Seiler, Soltman, Beaukers, Brown; Row 2—Hanna, Wortman, Mayer, Holsinger, Finguerra, Roberts, Gubala, Peyrebrune; Row 1—Rogow, Small, Ney, Tucker, Jelinovic, Rushing, Main Mazzaferro.
(Boring—not present when picture taken.)

NU Traffic Institute Celebrates 25th Anniversary

The 25th anniversary of the Traffic Institute at Northwestern University was celebrated in Chicago and Evanston at the time of the recent National Safety Congress. Feature of the day-long affair was a reception and dinner on Saturday, October 14, at a Chicago hotel. Principal speaker at the dinner was Tom C. Clark, associate justice of the Supreme Court of the United States, who paid tribute to the University, the founders and the directors of the Traffic Institute.

Honored for their contribution to the Traffic Institute were Paul G. Hoffman, James S. Kemper, Hathaway G. Kemper, Andrew J. Kavanaugh, Norman C. Damon and Franklin M. Kreml (who conceived the idea of the Institute and was its first director)—the six founders.

The directors saluted were Robert E. Raleigh and Robert L. Donigan, former directors, and Bernard R. Caldwell, present director. Both founders and directors received plaques and silver keys of the Institute from Dr. J. Roscoe Miller, president of Northwestern University.

Established in 1936 at a police traffic training school with two staff members and a secretary, the Traffic Institute has expanded its program to include virtually all types of traffic training, field and extension services, research and development, a legal information service, and publications in the field of street and highway traffic. The Traffic Institute now has 50 full-time employees and 75 part-time guest instructors.

Nearly a thousand police officials have completed the famous "long course" at the Traffic Institute and more than 12,000 have completed short courses in the 25-year-life-span of the institution.

Womack Elected AASHO President

John C. Mackie (Michigan), left, and J. C. Womack (California), right at AASHO Meeting.

J. C. Womack, state highway engineer of the California Division of Highways, was elected president of the American Association of State Highway Officials at the meeting of the association held in Denver in October. Elected first vice president at the same time was John C. Mackie, Michigan state highway commissioner.

Baker Given Award for Research Work

The 1961 Metropolitan Life Award for Research in Accident Prevention has been presented to J. Stannard Baker, director of research at the Northwestern University Traffic Institute. The award, which is administered by the National Safety Council, was presented to Mr. Baker at the recent National Safety Congress in Chicago. Basis of the award was Mr. Baker's work on case studies of traffic accidents.

Mr. Baker, who is a past winner of the Paul Gray Hoffman Award, has been in his present post for a number of years. Earlier he worked for the Detroit Street Railways, following a major period of service with the National Safety Council. He is an Associate Member of the Institute of Traffic Engineers.

American Transit Association Elects Johnson

Frederick J. Johnson, president of the Milwaukee and Suburban Transport Corporation, was elected president of the American Transit Association at a recent meeting in Dallas. Mr. Johnson is also chairman of the board of the Indianapolis Transit System and president of the Louisville Transit Co. He is a member of the Institute of Traffic Engineers.

Re-elected as director at the same meeting were Hadley B. Cammack, executive director of the Savannah Transit Authority, and F. Norman Hill, general manager of the San Antonio Transit System. Mr. Cammack is a member, and Mr. Hill an affiliate, of the Institute of Traffic Engineers.

Hoffman Award Conferred on Scheidt

The 5th Annual Paul Gray Hoffman Award for distinguished professional service in highway safety has been conferred on Edward Scheidt, commissioner of the North Carolina Department of Motor Vehicles.

The award was presented in Chicago at the Silver Anniversary Dinner of the Northwestern University Traffic Institute by the donor, Mr. Hoffman, former president of Studebaker Corporation, and himself a noted pioneer in the U. S. highway safety movement. Mr. Hoffman, former ECA Administrator, is now serving as Managing Director of the United Nations Special Fund.

Purpose of the award is to recognize and encourage the work of educators, enforcement officials, engineers, researchers, organization executives and others who make their careers in traffic safety.

Commissioner Scheidt was honored for his outstanding work in upgrading the North Carolina Department of Motor Vehicles until it has become a national model in terms of organization, facilities and operations, and for other achievements.

Commissioner Scheidt, who heads the Officials Division of the Governor's Traffic Safety Council in his state, is chairman of the National Committee on Uniform Laws and Ordinances and of the Committee on Enforcement and Traffic Safety, American Association of Motor Vehicle Administrators. He is also a past president of the Association of State and Provincial Safety Coordinators.

The board of judges for the Hoffman Award includes Rex M. Whitton, Federal Highway Administrator; Dr. John A. Hannah, President, Michigan State University; Herschel D. Newsom, Master of the National Grange; W. Earl Hall, Editor of the Mason City (Iowa) Globe-Gazette; and Mrs. Raymond B. Sayre, former Chairman of the Women's Group, President's Committee for Traffic Safety.

The award is administered by the Automotive Safety Foundation of Washington, D. C., an organization of which Mr. Hoffman was first president and chairman.

President's Committee For Traffic Safety Enlarged

The White House has announced that President Kennedy has enlarged the membership of the President's Committee for Traffic Safety by the addition of the Secretaries of Commerce, Defense, Labor, and Health, Education, and Welfare as *ex officio* members. This brings the total membership of the Committee to a maximum of twenty-two.

The text of the President's executive order follows:

THE WHITE HOUSE
EXECUTIVE ORDER

Amendment of Executive Order No. 10858, Relating to the President's Committee for Traffic Safety

By virtue of the authority vested in me as President of the United States, it is ordered that Executive Order No. 10858, dated January 13, 1960, and headed "The President's Committee for Traffic Safety," be, and it is hereby, amended by substituting for paragraph (b) of section 1 thereof the following:

"(b) The President's Committee for Traffic Safety (hereinafter referred to as the Committee) shall be composed of not more than eighteen members to be appointed by the President from among individuals active in agriculture, business, labor, public-information media, civic, service, and women's organizations, State or local governments, and such other fields as the President may from time to time determine. The Secretaries of Defense, Commerce, Labor, and Health, Education, and Welfare shall serve as *ex officio* members of the Committee."

John F. Kennedy

THE WHITE HOUSE,
October 10, 1961

Damon, Brown and Bennett Honored By IACP

In the closing session of its annual conference October 5 in Montreal, the International Association of Chiefs of Police awarded Distinguished Service Memberships to Norman Damon, vice president, Automotive Safety Foundation; Russell I. Brown, president, and Richard O. Bennett, secretary-treasurer, Insurance Institute for Highway Safety, all of Washington, D. C.

These men and their organizations, says the IACP, have supported police traffic research and training for many years, and the Distinguished Service Memberships are in recognition of their efforts.

Only four other Distinguished Service Memberships have been awarded by the IACP in its 68 years of existence.

World Traffic Engineering Conference Papers Available

Copies of the advance papers prepared for the International Sessions of the World Traffic Engineering Conference are available at ITE Headquarters in Washington. This is a bound volume of 338 pages. Included without extra cost will be mimeographed copies of the six general reporters' papers which were not distributed in advance. The stock is limited, but orders will be filled promptly as long as the supply lasts.

A Spanish translation of the bound volume is also available at ITE Headquarters, but the reporters' papers are not available in Spanish. The price for either volume is $7.50.

Film Available on Professionalism and Engineering

"George Spelvin, P.E.," a 22½-minute film on professionalism and engineering, is now available from the National Society of Professional Engineers for showings to engineering school students and recent graduates.

The film was made under the supervision of the National Society's Public Relations Committee as part of an over-all program to help develop professional concepts on the part of engineering students and graduates.

Prints of the film in 16 mm color, may be borrowed from the National Society headquarters, 2029 K Street NW, Washington 6, D. C.

Produced by Norwood Studios, Inc., Washington, D. C., the film is centered around a young engineer who is designing a fuel handling memory and control system for a nuclear power plant. Through narration and dialogue, the film goes back into his life to illustrate the things which have brought him to professional status—ethics, graduate education, the EIT examination, participation in civic affairs, registration, public speaking and the importance of personal broadening in fields outside the technical area of specialized engineering work.

National Society President Murray A. Wilson has termed the production "the first filmed presentation of the professional aspects of an engineering career."

The premiere showing of the film was held in Roanoke, Va., at the fall meeting of the Board of Directors of the 56,000-member engineering group.

HRB Launches Expansion Program

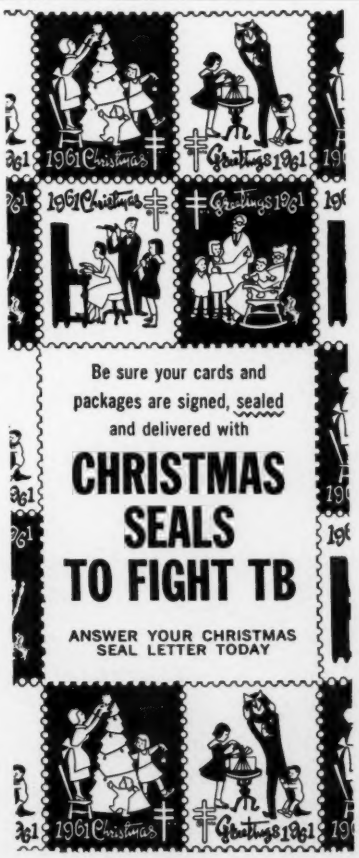
An expansion program for the Highway Research Board, National Academy of Sciences-National Research Council, has been initiated with announcement of a new industrial associate category.

The Board, which is being called upon for more research correlation service to state highway departments, universities, and private industries involved in highway development and transportation, has been promised substantial assistance in such an expansion by the U. S. Bureau of Public Roads and the American Association of State Highway Officials.

The Bureau has authorized an additional $25,000 for Board activities, and the 52-member highway departments of AASHO another $100,000.

It is expected that industries which depend heavily upon improvement of the nation's highway systems through research will participate in the expansion program also. To make this possible, the National Academy of Sciences-National Research Council has approved creation of a new category of Industrial Associates. The annual dues will be $1,000 per organization.

"Industrial participation in Highway Research Board activities has been steadily increasing in recent years," William A. Bugge, HRB chairman, said in announcing the expansion plan. "Manufacturers of equipment, materials and other products in the highway-related industries recognize that we must continue to develop ways of improving the nation's highways through research. The Board's role is to keep them abreast of research developments through dissemination of publications and provide a forum for presenting and discussing research findings in the highway field. We are assured by industry members of the Board that they are in favor of expanding such opportunities and the dissemination of research findings, and will support the program wholeheartedly."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Greetings 1961
Be sure your cards and packages are signed, sealed and delivered with
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The Board's larger budget will permit enlargement of the professional engineering staff, a step-up in its publication program, and an expansion of the research correlation service.

Iudustry officials desiring more information about Board activities and the new associate membership should contact HRB at 2101 Constitution Ave., N. W., Washington, D. C.

New Publications

Transportation Design Considerations

Publication 841, National Academy of Sciences, Publications Office, 2101 Constitution Avenue NW, Washington 25, D. C., 1961. 243 pp. $4.00.

The Woods Hole conference on Transportation held in August, 1960 was first reported on in Publication 840 of the National Academy of Science entitled "Conference on Transportation Research." This was Volume I and reported on the study group's appraisal of transportation problems and needs for research.

Volume II has now been published and is the one reviewed herein. This volume contains the invited papers and prepared discussions presented at the conference. Only those which were significant, novel and not already available elsewhere or published separately were included.

Volume II is divided into two parts. The first includes introductory remarks by three speakers during the first week of the conference and a dozen discussions on analytical techniques or on technology presented during the third week of the proceedings. In the second part, the authors deal with questions based in the social sciences, giving particular consideration to the environmental and institutional framework of transportation. Most of the prepared texts presented during the second week are reproduced here. It is the hope of those who participated in the conference that this material, which provoked so much thought and discussion during the course of the meetings, will be found equally useful and stimulating by students of transportation as well as by those who are thoughtfully concerned with the directions of the economic, social, and industrial growth of our nation.

signs
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Steel signs give you more strength, permanence and economy for your highway dollar. Whatever your sign requirements, U.S. Steel can supply USS Galvanized, VITRENAMEL, cold-rolled carbon steel, or extra-corrosion-resistant USS COR-TEN Steel sheets. For supports a variety of shapes are available in carbon or USS COR-TEN Steels. By specifying steel you get strength, versatility and economy, and added corrosion resistance where you need it.

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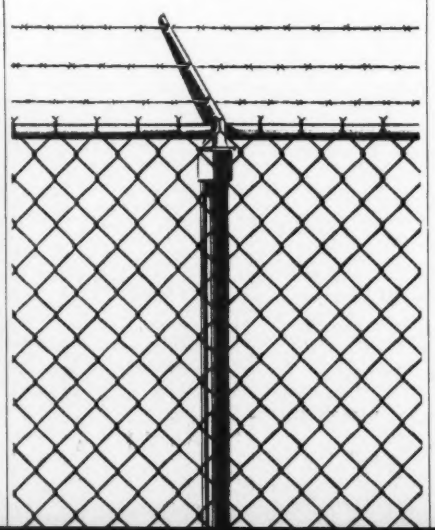
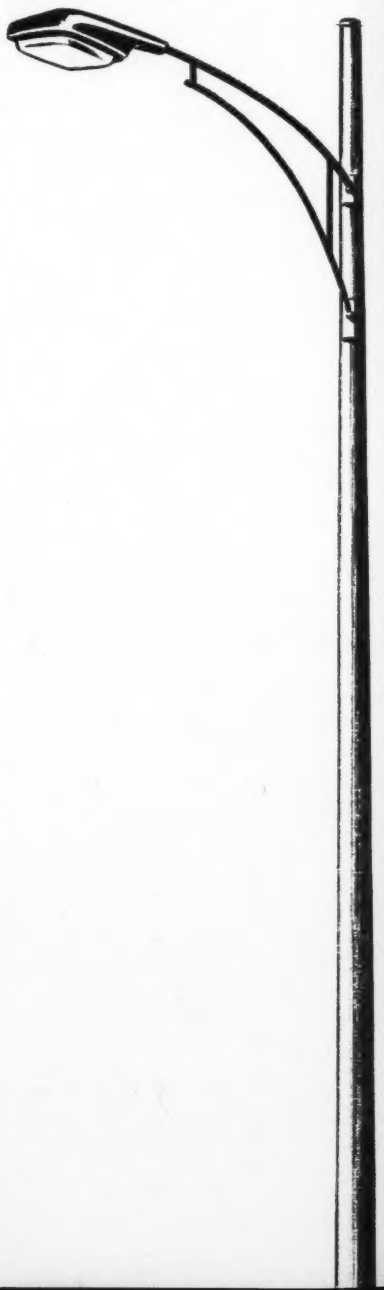
With more limited-access roads being built, the need for right-of-way fencing has increased greatly. Ideal solution: low initial cost; fast, inexpensive erection; rock-bottom maintenance cost; strength. All these are yours by combining USS barbed wire with either galvanized or aluminum-coated steel, USS CYCLONE Chain Link Fence and USS AMERICAN Woven Wire Fence.



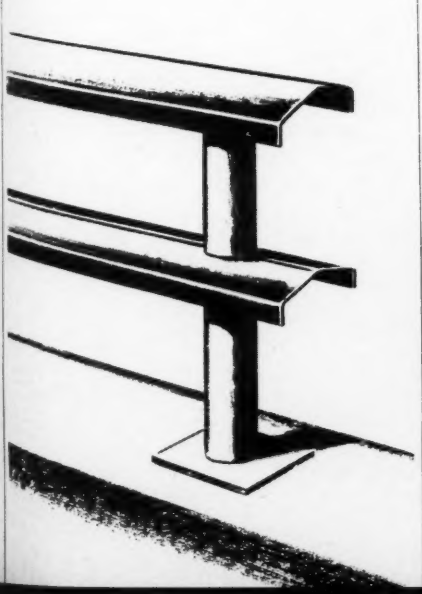
light standards

USS MAN-TEN and USS COR-TEN Steels are high-strength steels with a 50,000 psi yield point. They provide strength for light poles, and USS COR-TEN Steel's corrosion resistance of 4 to 6 times that of carbon steel is ideal for hollow poles where interior corrosion might otherwise be a problem. Because these steels are stronger, lighter designs are possible. These designs provide strength, economy, easier erection, and long life.



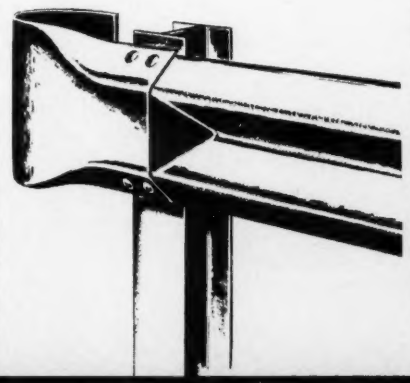
bridge rail

Bridge rail design should consider post anchorage and strength, rail continuity, and ductility of members to provide optimum safety. Here is where steel is superior to any other material. In addition, easy maintenance, speedy erection, easy repair, pleasing appearance and over-all economy are achieved with steel.



guard-rail and posts

Again for maximum safety, only steel offers strength combined with toughness, the most important requirement for guardrail installations. Steel guardrail can take impact without shearing. Strong steel posts hold guardrail firmly in place, are easily driven, offer quick, low-cost installation. Corrosion-resistant USS COR-TEN Steel is also available for guardrail and posts. The three most common types of guardrail are steel cable, steel plate, and steel beam. 10 or 12-gage steel beam is the most popular, and the use of galvanized rails and posts is increasing because of the over-all economy realized.



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U.S. Steel's "Highway Hardware Technical Notebook" is available upon request. In addition, further information on any of the many USS highway products can be obtained by writing to United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania. USS, MAN-TEN, COR-TEN, VITRENAMEL, CYCLONE, AMERICAN are registered trademarks.

USS

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U. S. Transportation—Resources, Performance and Problems

Publication 841-S, National Academy of Sciences, Publications Office, 2101 Constitution Avenue NW, Washington 25, D. C. 1961. 319 pp. $4.00.

This collection of background papers on the Woods Hole Conference forms a supplement to Volume II reviewed above. During the conference a number of papers were presented on the resources, performance and problems of each mode of transportation in the United States. The papers contained such a wealth of information that was otherwise difficult to obtain or unavailable in a convenient form, that the participants urged its publication in book form. Highways including truck and bus operations, transit, commercial airlines, railroads, inland waterways, pipelines and the maritime industry are represented among the papers presented.

In addition to the complete volume, a limited number of reprints of the first 86 pages have been bound together in a publication entitled "Highway Transportation." This volume presents only the material supplied by Mr. E. H. Holmes on the subject of highways and is available from the same source at $1.50 a copy.

The AASHO Road Test: History and Description of the Project

Special Report 61-A. Highway Research Board, 2101 Constitution Avenue, Washington 25, D. C. 1961. 56 pp. $2.40.

The first report on the AASHO Road Test at Ottawa, Ill., is presented in three chapters. The first is an introduction to the project outlining its development, purposes and objectives, and the applicability of the findings. The second chapter contains general information about the project site, the test facilities, the test traffic, and also outlines the measurements, data processing, and analysis programs. The third chapter describes the experiment designs, layouts and cross-sections, discusses the research studies for pavements and bridges, and includes descriptions of certain associated studies conducted at the test site.

Other reports will describe materials and construction of the test road, operation of traffic, research on flexible and rigid pavement sections, research on bridges in the test, special studies, and a final summary.

Freeway Design and Operations

Bulletin 291. Highway Research Board, 2101 Constitution Avenue, Washington 25, D. C. September 1961. 206 pp. $4.00.

This bulletin contains seven papers presented at the 40th Annual Meeting of the Highway Research Board, as follows:

"Capacity Study of Signalized Diamond Interchanges," by Donald G. Capelle and Charles Pinnell.

"Freeway Traffic Accident Analysis and Safety Study," by B. F. K. Mullins and C. J. Keese.

"Development of an Automatic Traffic Flow Monitor and Control System," by Robert S. Foote.

"Operational Study—Schuylkill Expressway," by Robert H. Pearson and Michael G. Ferreri.

"Accident and Operating Experience at Interchanges," by R. L. Fisher.

"Application of Computer Simulation Techniques to Interchange Design Problems," by Aaron Glickstein, Leon D. Findley, and S. L. Levy.

"A Qualitative Evaluation of Traffic in a Complex Freeway Network," by Robert Brenner, Edward T. Telford, and Donald Frischer.

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Land Use and Development at Highway Interchanges: A Symposium

Bulletin 288. Highway Research Board, 2101 Constitution Avenue, Washington 25, D. C. July 1961. 82 pp. $1.80.

This bulletin contains five papers dealing with the subject as presented at the 40th Annual Meeting of the Highway Research Board, as follows:

"The Highway Interchange Land-Use Problem," by David R. Levin, with a discussion by Karl Moskowitz and a closure by the author.

"User Services and the Demand for Land at Interchange Points," by Duane F. Marble.

"Highway Interchanges and Land-Use Controls," by William H. Stanhagen.

"Supply and Demand for Land at Highway Interchanges," by William L. Garrison.

"An Evaluation of Land-Use Control Procedures at Freeway Approaches," by Edgar M. Horwood, Charles H. Graves, and Clark D. Rogers.

The Highway Transportation Story—In Facts

National Highway Users Conference, 966 National Press Building, Washington 4, D. C. 4th Edition. September 1961. 44 pp.

By means of charts and short statements, this booklet attempts to answer the question of "What highway transportation means to a number of segments of our economy." These segments range from the family, the community, and industry through national defense and public health. The complete inseparability of highway transportation from modern living in the United States is well documented in an easy-to-visualize way.

A Directory of Transportation Education in American Colleges and Universities

Compiled by Gilbert James. The Transportation Center, Northwestern University, 1818 Hinman Ave., Evanston, Illinois. 50 pp. $3.50.

Over 2,000 institutions of higher education were contacted to determine what and where transportation education opportunities exist in the U.S. The result is a directory which lists three categories of colleges and universities offering transportation courses. The three categories are:

1) A major academic program in transportation

2) A non-credit short course program for industry personnel

3) An offering of one or more transportation courses.

Guide to Traffic Safety Literature—1960

Vol. 5, National Safety Council, 425 N. Michigan Ave., Chicago 11, Illinois. 1961. 60 pp. $1.00.

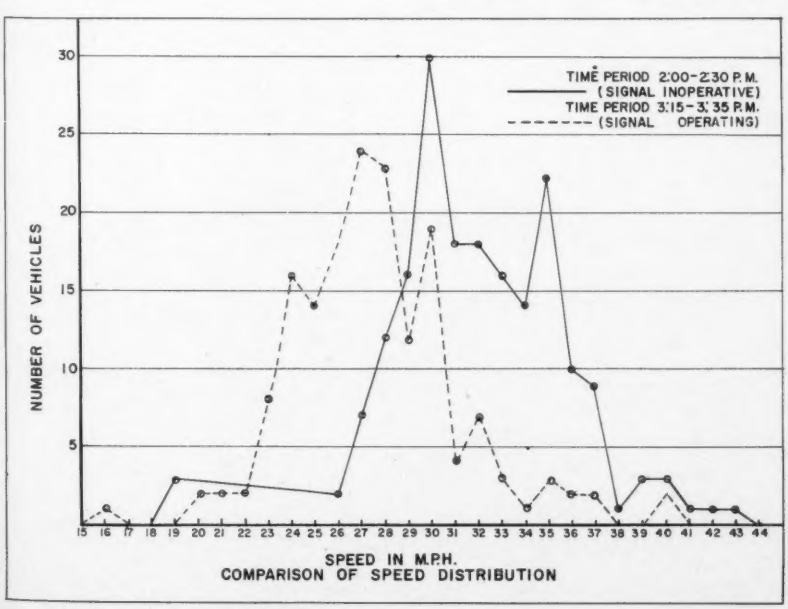
This booklet, published annually, lists the sources of traffic safety articles from numerous books, pamphlets, and periodicals for the year 1960. All areas of traffic safety are included.

INCREASED PROTECTION

(Continued from page 17)

ing to observe greater caution when it realizes that the request for caution is limited to only those times when a hazard is present. The comparison of the speed distribution curves in Figure 7 for two different periods on the same afternoon clearly indicates that this is the case.

A third and final conclusion of this study is that although the device used has a greater initial cost than the ordinary school warning sign, in those locations where sufficient hazards are present, the device is truly effective and the signs are not. Public opinion regarding hazards to school children is very strong and a program of providing protective devices such as described herein will not only be accomplishing more positive results, but will be improving public relations at the same time.



COMPARISON OF SPEED DISTRIBUTION

New Appointments

Mickle Named Deputy Federal Highway Administrator

D. Grant Mickle (Member, ITE) has been appointed to the newly-created post of Deputy Federal Highway Administrator of the Bureau of Public Roads by Secretary of Commerce Hodges.

D. Grant Mickle

The position of Deputy Administrator was established by Congress this year when the position of Commissioner of Public Roads was abolished. In his new capacity, Mr. Mickle will be first assistant to Federal Highway Administrator Rex M. Whitton.

Mr. Mickle had been with the Automotive Safety Foundation as director of the traffic engineering division since 1943. During that time he served as adviser or director for traffic surveys and studies in a number of states and cities throughout the country. In 1954 he was invited by a group of businessmen in Melbourne, Australia to advise them and their public officials on their growing traffic problems.

From 1940 to 1943 Mr. Mickle was traffic engineer for the City of Detroit, a position he accepted after organizing the traffic and safety division of the Michigan State Highway Department and serving as its first director. Earlier he had been assistant director and planning engineer of the Michigan Highway Planning Survey from 1935 to 1939. He started his professional career with the Massachusetts Department of Public Works after receiving his B.S. degree in civil engineering at the University of Michigan. In 1931 he received his M.S. degree from Harvard University.

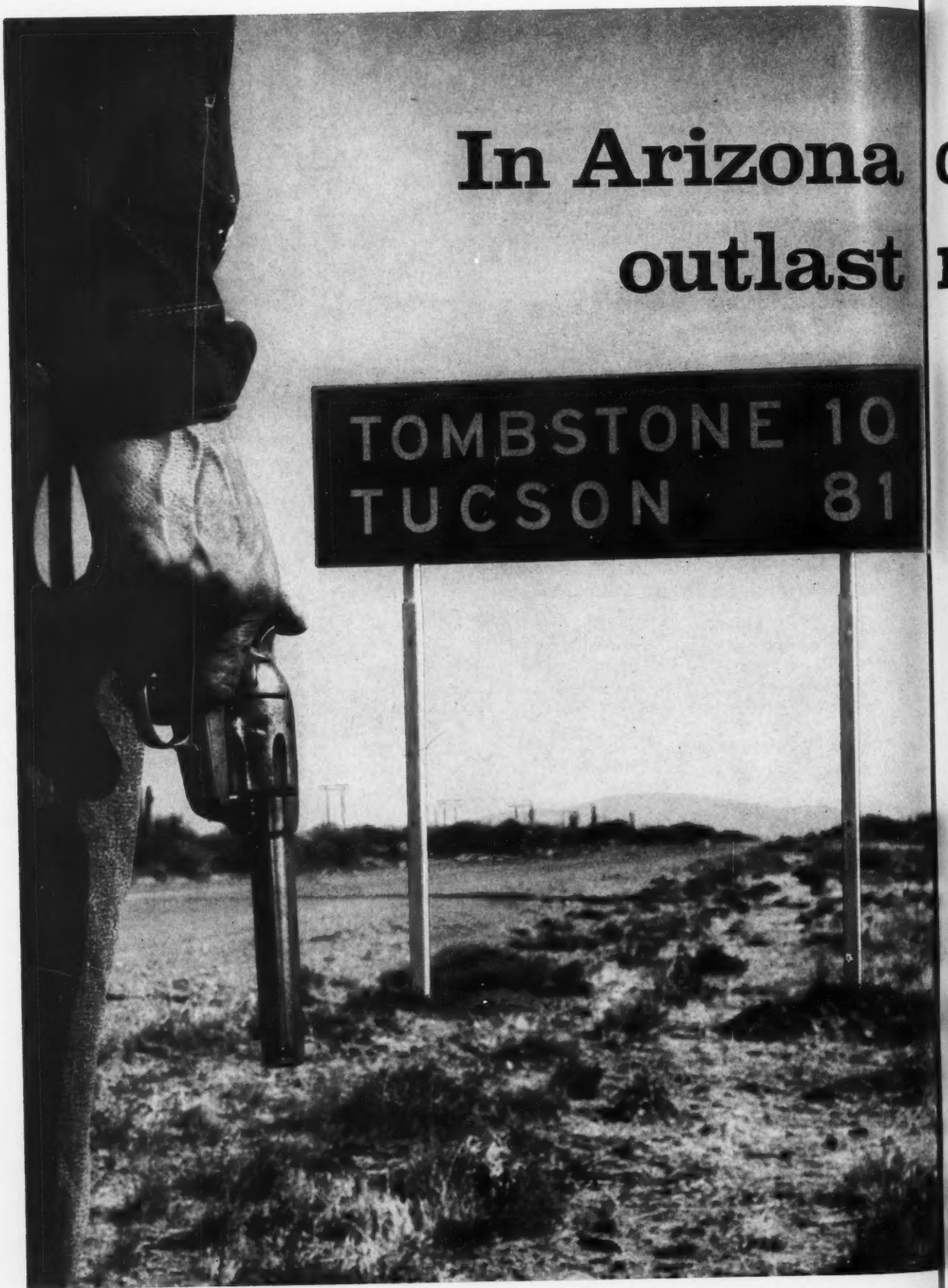
In 1958, Mr. Mickle received the Theodore M. Matson Memorial Award for outstanding contributions to the field of traffic engineering.

He is a past president of the Institute of Traffic Engineers and has been active in technical and administrative committee work of the organization. In addition, he is a member of the American Society of Civil Engineers, the American Public Works Association and the American Society of Planning Officials. He is a registered professional engineer.

Olcott to Head Planning Division of Port Authority

Edward S. Olcott (Assoc. Mem., ITE) has been named chief of the Planning Division of the Port Development Department of the Port of New York Authority. In his new capacity he succeeds Hayden B. Johnson, who has been designated as Deputy Director of Port Development.

Mr. Olcott, who joined the Port Authority staff in 1949, has been assistant chief of the division for the past two years. Earlier he was an assistant highway planning engineer. He acted as project coordinator on the Joint Study of Arterial Facilities for the New York-New Jersey Metropolitan Area made by the Port Authority and the


In Arizona o
outlast m
TOMBSTONE 10
TUCSON 81

overlaid plywood signs metal 3 to 1

SIGN REPLACEMENT WAS A REAL PROBLEM IN ARIZONA until the Highway Department switched to plywood. Trigger-happy motorists had been taking pot shots at metal signs. This led to rust, deterioration and often dangerously reduced legibility after only a few months of use. Then performance tests showed overlaid plywood's life expectancy was at least three times that of metal.

Now Arizona uses overlaid plywood for 85% of its signs. Vandals still shoot at them. But plywood stands up to both deliberate and accidental abuse without losing legibility. Bullets go right through without shattering the sign face. There's no corrosion problem; repairs are made quickly.

Overlaid plywood withstands Arizona's weather, too, with its extremes of heat, rain and snow. The plywood is completely waterproof, and the smooth, durable plastic-like surface makes an ideal base for reflectorized material.

Besides saving on maintenance and replacement, plywood signs are simple and inexpensive to fabricate. In Arizona's sign shop, a production-line process is used to make about 70 different basic signs, most with reflectorized legends.

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DFPA TESTED QUALITY

Plywood signs on Arizona's highways not only resist abuse from vandals and a rugged climate, but are attractive and easy to read. Fabrication in the state's sign shops is simplified because standard-sized panels of plywood are easy to store and easy to cut to required sizes and shapes. Above, reflectorized letters are applied to an overlaid plywood sign.

Triborough Bridge and Tunnel Authority in 1955. The study recommended construction of the Throgs Neck Bridge, the Narrows Bridge, and the second deck of the George Washington Bridge. From 1957 to 1959, Mr. Olcott was executive assistant to the Director of Port Development. Last year he was in charge of the staff working on studies which led to the proposal to acquire and modernize the Hudson and Manhattan Railroad.

Edward S. Olcott

Mr. Olcott attended Yale University, where he received his B.S. degree. He also completed the program at the Yale Bureau of Highway Traffic. During World War II he served in the Engineer Corps of the United States Army. In addition to his Institute membership, he is a member of the American Society of Civil Engineers.

Robinson Heads ASF Traffic Engineering Division

Carlton C. Robinson (Assoc. Mem., ITE) has been appointed Director of the Traffic Engineering Division of the Automotive Safety Foundation.

Mr. Robinson, who has been a traffic engineer with the Foundation since 1955, succeeds D. Grant Mickle, who has been named Deputy Federal Highway Administrator by Secretary of Commerce Luther Hodges.

A native of Long Beach, Cal., Mr. Robinson is a graduate of Oregon State College and the Yale University Bureau of Highway Traffic and was Assistant Traffic Engineer of Portland, Ore. before joining the Foundation's staff.

At the request of the District of Columbia Commissioners, he directed a study during 1958 and 1959 which led to a reorganization of the D. C. Department of Highways, and transferred traffic engineering responsibilities from the Department of Vehicles and Traffic to an enlarged Department of Highways and Traffic. He also directed street transportation management studies for San Francisco and for Boston.

Mr. Robinson has worked with traffic engineers, urban planners and highway officials in many parts of the country in an effort to improve techniques for traffic control on freeways. He is the principal author of the book "Freeway Operations," recently published by the Institute of Traffic Engineers.

Carlton L. Robinson

He also is the author of a short course guide for traffic engineering training and assisted the National Committee on Urban Transportation in the publication of a series of technical manuals on urban transportation planning.

Mr. Robinson is Chairman of the Technical Council of the Institute of Traffic Engineers and also is a member of the American Society of Civil Engineers and of the Traffic Flow Theory and Highway Capacity Committees of the Highway Research Board. He is a registered professional engineer in the District of Columbia and Oregon.

Marks Joins Gruen Firm

Harold Marks (Assoc. Mem., ITE) former County Administrative Civil Engineer, has been named head of the Traffic and Transportation Division of Victor Gruen Associates, architectural, planning and engineering firm.

Mr. Marks will take charge of traffic analysis work in connection with the Gruen firm's many downtown planning, urban redevelopment and shopping center projects.

Before assuming his new post, Mr. Marks served for 13 years in the Los Angeles County Road Department directing the traffic planning program, while coordinating freeway planning and design with the State Highway Department and providing traffic consultation to the Regional Planning Commission.

Harold Marks

His prior experience includes traffic consultant work with several city planning and engineering firms.

Mr. Marks is a graduate of Cooper Union Institute of Technology in New York and is licensed as an engineer in both New York and California. He is the author of numerous articles and technical papers and is currently on the staff of the University of Southern California as a lecturer in Transportation Engineering.

Gay to Direct American Standards Association

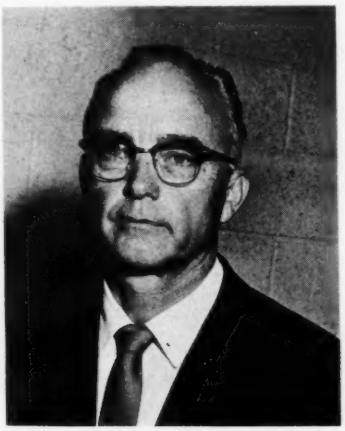
Roger E. Gay, former president of the Bristol Brass Corporation, will succeed Vice Admiral George F. Hussey, Jr., USN (Ret.), as managing director of the American Standards Association effective January, 1962.

Mr. Gay is leaving his management consultant practice to become the third managing director of the 43-year-old voluntary national standards body. President of ASA from 1952-1954 and a member of its board of directors for nine years, he will join the ASA staff November 1. He is a fellow of the Standards Engineers Society and received in 1957 the annual award of SES and the American Society for Testing and Materials.

Hale Elected Board Chairman of Park-O-Meter

G. A. Hale has been elected chairman of the board of directors of the Magee-Hale Park-O-Meter Company of Oklahoma City. G. E. Nicholson of Tulsa, Oklahoma, has been elected president, replacing Mr. Hale.

Mr. Hale is one of the developers of the parking meter. He was a member



G. A. Hale

of the engineering faculty at Oklahoma A & M (now Oklahoma State University) when Carl A. Magee, then editor of the *Oklahoma News*, brought him a rough model of what was to become the first parking meter.

After about two years work, the Park-O-Meter was perfected and the first installation was made in Oklahoma City in 1935. The firm's meters are in use today in more than 1400 cities all over the world.

Wickstrom Given Top Engineering Post with PJ Study

George V. Wickstrom (Assoc. Mem., ITE) has been promoted to Transportation Division Director, top engineering post of the Penn-Jersey Transportation Study.

The study (PJ), is a combined effort by nine counties on both sides of the Delaware River, including the City of Philadelphia, the state highway departments of Pennsylvania and New Jersey, and the U.S. Bureau of Public Roads. PJ's assignment is to determine what general type of transportation plan and program — both rail and highway—will best serve the needs of the Camden-Philadelphia-Trenton Metropolitan Region.

Mr. Wickstrom replaces Michael J. Gittens (Member, ITE) whose appointment as Philadelphia's Chief Traffic Engineer was recently announced.

Prior to joining the PJ staff as chief of its traffic engineering section in September 1959, Mr. Wickstrom had been senior traffic engineer for Edwards and Kelcey, Inc., consulting engineers of Newark, N. J., and assistant civil engineer for the New York City Depart-

George V. Wickstrom

ment of Traffic. He received his bachelor's degree from the Cooper Union College of Engineering and is a graduate of the Yale University Bureau of Highway Traffic. He is a registered professional engineer in New Jersey, Pennsylvania, and New York.

Allen Named to IIHS Board

Cole A. Allen, vice president, engineering, of the American Mutual Liability Insurance Co., Wakefield, Mass., has been named to the Board of Governors of the Insurance Institute for Highway Safety, Washington, D. C.

The new Board member succeeds Arthur S. Johnson, retiring vice president, engineering, of American Mutual Liability Insurance Co. Mr. Johnson resigned from the IIHS Board after serving in that capacity since the establishment of the Insurance Institute for Highway Safety in January, 1959.

Members of the IIHS are the Association of Casualty and Surety Companies, the National Association of Automotive Mutual Insurance Companies, and the National Association of Independent Insurers.

Each association has three members on the IIHS Board of Governors, and the general managers of the three associations serve as ex-officio members.

The National Association of Automotive Mutual Insurance Companies designated Mr. Allen to succeed Mr. Johnson on the IIHS Board of Governors.

Title Changes

Charles Dwight Hixon—is now Director, Division of Transportation Planning of the Nashville, Tennessee, Traffic Commission; was Traffic Plans Engineer.

William J. Miller, Jr.—is now Director of Operations of the State Highway Department in Dover, Delaware; was Deputy Chief Engineer.

Carlton C. Robinson—is now Director of the Traffic Engineering Division of the Automotive Safety Foundation in Washington, D. C.; was Traffic Engineer.

Job Changes

Robert J. Allen—formerly Executive Director of the Arizona Traffic Safety Foundation in Phoenix; is now Assistant Director of the North Carolina Traffic Safety Council in Raleigh, North Carolina.

Charles L. Baule—formerly Civil Engineer with the La Crosse Dredging Corporation in Chicago, Illinois; is now Traffic Engineer with H. W. Lochner, Inc., in Chicago, Illinois.

James D. Decker—formerly Highway Research Engineer with the Virginia Council of Highway Investigation and Research in Charlottesville, Virginia; is now an Associate Engineer with Wilbur Smith & Associates in Columbia, South Carolina.

Kenneth P. Furness—formerly Assistant Route Analysis Engineer with the Planning & Design Division of the Ontario Department of Highways in Toronto, Ontario; is now on Assignment from De Leuw, Cather & Co. of Canada as United Kingdom Representative (Traffic Division) in Birkenhead, Cheshire, England.

Michael J. Gittens—formerly Director of the Transportation Section of the Penn-Jersey Transportation Study in Philadelphia; is now Deputy Commissioner of the Department of Streets, Bureau of Traffic Engineering in Philadelphia, Pennsylvania.

Bruce M. Gramling—formerly Assistant Director of Intersection Control with the New York City Department of Traffic; is now Traffic Engineer with the East Hudson Parkway Authority in White Plains, New York.

George P. Guthrie, Jr.—formerly with the Ohio Department of Highways in Columbus, Ohio; is now Contract Analyst with the Autonetics Division of North American Aviation Inc. in Anaheim, California.

Neil Kenig—formerly Traffic Engineer with the Bureau of Street Traffic in Chicago, Illinois; is now with Meissner Engineers, Inc. in Chicago, Illinois.

Melvin C. Pohlkotte—formerly Signal Engineer with the City Bureau of Traffic Engineering in Indianapolis, Indiana; is now Director of the Bureau of Traffic Engineering of the City of Evansville, Indiana.

Ralph E. Schofer — formerly Traffic Engineer with the Washington, D. C. Department of Highways and Traffic; is now Highway Engineer with the National Capital Transportation Agency in Washington, D. C.

Eugene L. Simm—formerly Traffic Engineer with the City Traffic Engineering Bureau in Harrisburg, Pennsylvania; is now Traffic Engineer with the City of Rochester, New York, Bureau of Traffic Engineering.

Coming Events

January 8-12—HIGHWAY RESEARCH BOARD—
Annual Meeting, Sheraton-Park Hotel, Washington, D C. Contact: HRB, 2101 Constitution Ave., Washington 25, D. C.

January 25-27 — CALIFORNIA STREET AND HIGHWAY CONFERENCE—
Sponsored by the Institute of Transportation and Traffic Engineering, at the Los Angeles campus of the University of California. Contact: ITTE, University of California, Los Angeles 24, California.

January 29-30—GEORGIA HIGHWAY CONFERENCE—
Sponsored by Georgia Highway Department and Georgia Tech's School of Civil Engineering. Contact: Director of Short Courses and Conferences, Georgia Tech, Atlanta 13, Ga.

February 2-9, 1962—NORTHWEST ROADS AND STREETS CONFERENCE
(Formerly the NW Highway Engineering Conference) Oregon State University, Corvallis, Oregon. Contact: B. J. McClarty, Secretary, NW Roads & Streets Conference, c/o Bureau of Public Roads, 720 SW Washington St., Portland, Oregon.

March 4-6—SOUTHERN SAFETY CONFERENCE & EXPOSITION—
Marion Hotel, Little Rock, Arkansas. Contact: W. L. Groth, Executive Director, P.O. Box 8927, Richmond 25, Va.

March 5-23—TRAFFIC ENGINEERING SEMINAR
Sponsored jointly by Northwestern University and Midwest Section, ITE, at Evanston, Illinois. Tuition $225. Contact: N.U. Traffic Institute, 1804 Hinman Ave., Evanston, Illinois.

April 17-19—WESTERN SAFETY CONGRESS & EXHIBITS—
Ambassador Hotel, Los Angeles, California. Contact: Joseph M. Kaplan, Manager, Greater Los Angeles Chapter—National Safety Council, 3388 W. 8th St., Los Angeles 5, Calif.

August 13-16—INSTITUTE OF TRAFFIC ENGINEERS—
32nd Annual Meeting. Denver-Hilton Hotel, Denver, Colo. Contact: ITE, 2029 K St. NW, Washington 6, D. C.

September 10 - 14 — SIXTH INTERNATIONAL STUDY WEEK IN TRAFFIC ENGINEERING—
Salzburg, Austria. Contact: OTA, 32 Chesham Place, London S.W. 1, England.

October 14 - 20 — INTERNATIONAL ROAD FEDERATION—
World Meeting, Madrid, Spain. Contact: IRF, 1023 Washington Bldg., Washington 5, D. C.

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NATIONAL ASSOCIATION

Position: Traffic Engineer with well known National Association active in Traffic & Safety.

Requirements: At least a B. S. engineering degree, in 30-40 year age bracket, with at least six years practical experience, preferably urban, at least three years in position of major responsibility. Must be able to write and speak effectively, and to work well with groups of laymen, engineers, and other professional groups. Ability to initiate, develop and prepare reports on projects without extensive or detailed supervision.

Salary: Good salary, desirable working conditions in city with many stimulating contact possibilities. Future is attractive for right person. Opening now available.

Apply: Write Box 1260 c/o Institute of Traffic Engineers, 2029 K Street, N.W., Washington 6, D. C.

LINCOLN, NEBRASKA

Position: Traffic Engineer to head a new department of Traffic Engineering in this midwestern city of 130,000 population. Will be responsible for surveys, traffic regulations and related matters.

Requirements: Graduate engineer with sufficient experience to adequately attack the problems involved.

Salary: $7,500 to $9,000.

Apply: Ray E. Ramsay, Personnel Director, City Hall, Lincoln, Nebraska.

RICHMOND, VIRGINIA

Position: City Traffic Engineer (This is a major bureau chief responsible directly to the Director of Public Safety.)

Requirements: College degree and experience at a responsible level in traffic engineering operations.

Apply: City of Richmond, Department of Personnel, Room 314, City Hall, Richmond 19, Virginia.

(Continued on page 42)

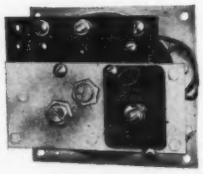
For Flashing Signals and Beacons

Specify The Flashers With Performance Proven Dependability

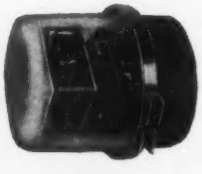
engineering and design features that have made Time-O-Matic the leading manufacturer of flashers since 1932

- open frame construction for efficient heat dissipation
- adjustable 50-60 flashes per minute
- not affected by extreme temperature variations
- slow speed induction motor
- hardened, polished pivots
- bearings, factory lubricated for life of the flasher
- available with or without radio interference eliminators

NEW ! !
Model 46
1 or 2 circuit, front-mounted cams and contacts out in the open for fast, easy adjustment, replacement. Compact size 4⅜" high, 4" wide, 2¼" deep



Model 3
1 or 2 circuits



Model 37 Jack-mounted
Available with or without meter base and cover, as shown, 1 or 2 circuits

Write for literature and specifications

TIME-O-MATIC
Division of E-S Industries, Inc.
A SIGN OF GOOD CONTROL SINCE 1932
P.O. Box 850, Danville, Illinois, Phone Hickory 2-0611
Canadian Agent: Sangamo, Ltd. • Leaside, Toronto 17, Canada

Applications

- Safety Zones
- Caution Signals
- Traffic Islands
- Loading Zones
- Warning Beacons
- Flashing Stop Signs

New Equipment and Methods

Publication of product announcements in this section should not be construed as endorsement or approval by the Institute of Traffic Engineers

Test Equipment for Flashers

To meet the need for a convenient portable instrument to measure flash durations of the usual 6-volt or 12-volt incandescent flasher, Northern Signal offers the newly developed Duratest—a self-contained, hand held instrument of complete portability. The system employs a transistorized circuit which measures the cumulative charge of a capacitor. The highway inspector may now equip himself to promptly and accurately check the flash duration of any incandescent flasher within the range of the instrument, with an accuracy of about 5%. The Duratest functions to measure the time of current flow through the filament of the lamp and registers in milliseconds on the meter scale. A nomogram is provided from which the per cent duty cycle is read directly. The user is, therefore, informed as to the flash duration in milliseconds and also the percentage of the complete work cycle, which is an integrated function of the number of flashes per minute and the duration of each flash. Neither lamp nor battery condition affects the accuracy of the measuring instrument—it will either read correctly, or, if the batteries are low, not at all. Flash intensity does not affect the behavior of the Duratest.

This instrument could well be of interest to any user of lights who is interested in a portable device for the purpose of testing flash durations for compliance with specification. It is temperature-stable between plus 30°F and plus 100°F.

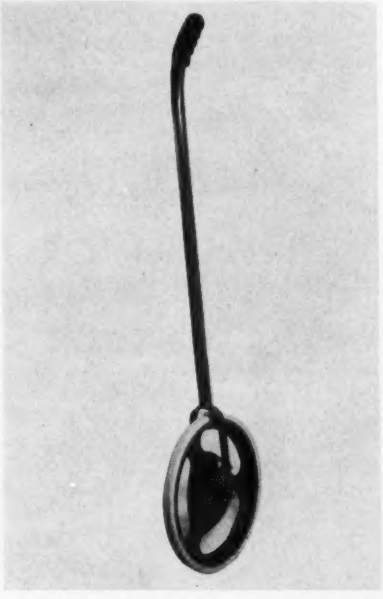
Price, with nomogram — (reading from 5% duty cycle to 50%) $135.00 net, f.o.b. factory.

Write: Northern Signal Company, Saukville, Wisconsin

New Measure Meter Available

The Wheel-N-Measure meter saves money with every step, claims the manufacturer. For those extra long measurements, this is the ideal way of doing it—the modern way to measure.

A one-man operation, it cuts estimating costs to a fraction. Gives you the exact measurement, no guessing. Saves you time and money and is better and quicker than two men with a tape or chain.



Just walk it along and run off the distance. Read the measurement in feet on the counter. It registers up to 9,999 feet. Light in weight, it weighs only 6 lbs. Veeder Root precision counter. Fast reset—just twist to zero. The cast aluminum wheel has a 36" circumference; bronze oilite bearing. Flat special rubber tire prevents slippage. Sturdy, accurately built to last for many years; excellent on smooth or rough terrain. The handle is tubular with a soft rubber grip.

Excellent for water, gas, electric companies; State Highway and Street departments; traffic engineers, police, and realtors; it is now available at the lowest price ever—only $49.50 each.

Available from the B. G. Reilly Co. P.O. Box 231, No. Scituate, R. I. specialists in measuring equipment for all industries.

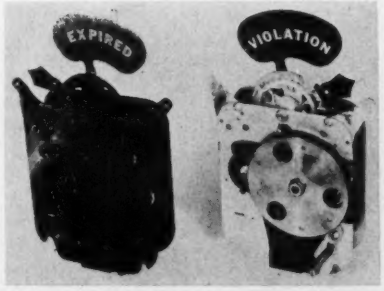
Ultrasonic Cleaning Services

On July 22, 1961, a serious fire swept the maintenance shop of the Department of Public Works in Newburgh. When brought under control, 85 parking meters, costing approximately $3400, were believed to be beyond repair. Since Ultrasonic Services Associates had previously cleaned some of these mechanisms for Newburgh, they were called in for an opinion. After examination in the USA laboratory at Oceanside, L.I., Newburgh was guaranteed that the meters could be restored to perfect working condition by Ultrasonic Services' special cleaning techniques for approximately $600. Newburgh accepted the proposal.

Two weeks later the damaged units were returned in "like-new" condition, as illustrated in the "before" and "after" photos. This included application of new "violation" decals to the flags. Net saving—$2800! Ultrasonic Services, which specializes in unusual ultrasonic cleaning and deburring techniques rather than the sale of Ultrasonic cleaning equipment, has many other similar cases in their files.

Many municipal governments, plants and shops, military installations may find it more economical to have their parking meters, fire alarm boxes, street light timers, traffic counters, missile components, electronic switches, relays, and other precision machines cleaned by USA rather than do it themselves. This is because the company has spent several years in intensive research to develop the most effective cleaning techniques for use with available ultrasonic equipment.

For a free informative brochure, write Ultrasonic Services Assoc., 3200 Lawson Blvd., Oceanside, L. I., New York.



Before and after ultrasonic cleaning by Ultrasonic Services Associates for the City of Newburgh.

Automatic Street Light Control Introduced

The new, automatic, on-at-dusk; off-at-dawn, plug-in street light control by Lightguard Electronic Mfg. Co., Inc. of Houston, Texas has an unusual power-saving feature, which is important in these days of rising energy costs. The novel design provides for simple screwdriver adjustment of the operating light level desired in the field, without removing the control from its receptacle. For example, it is possible to change the light operating level at dusk from ½ to 3 foot-candles and to read the foot-candle setting in the light-admitting window.

With full load of 1500 watts on the control, called the Dialatrol, and at present kilowatt-hour costs, it is possible to save several dollars per year by setting the operating level at ½ rather than 3 foot candles. But in those areas where lighting may be critical, such as important highway intersections, it takes only a turn of the screw to turn the light on earlier in the evening. It is not necessary to return the control to the photometric laboratory for resetting, and the Dialatrol case need not be opened.

This feature is of special interest to utilities, who are now leasing outdoor lighting to their customers on a contract basis. The utility is concerned with providing adequate lighting from dusk to dawn, but desires to have the light on only as long as necessary. The

Dialatrol permits this adjustment to be made in the field.

Other new features include varistor surge-protection for the hermetically-sealed photoconductive cell, as well as a 1500-watt rating with incandescent lamp loads, since so many floodlights of this wattage are now available.

Other desirable features include the total elimination of trouble-causing capacitors and rectifiers from the circuit, an excellent lightning arrestor, and a tough aluminum case designed to resist impact of hail.

Lightguard Electronic Mfg. Co., Inc., 1213 St. Emanuel Street, Houston 3, Texas.

Lull Introduces Ice Removal Equipment

The Lull Engineering Co., Inc., of St. Paul, Minnesota, has recently introduced a new improved model of their truck-mounted ice blade which, the manufacturer states, makes highway, street, and airport removal of ice, sleet and packed snow far easier, faster, and cheaper than through the use of other types of equipment and materials.

The Lull ice unit consists of a power hydraulic operated under body mounted blade of either 8 or 10 foot width which is completely controlled from the truck cab through the operation of a series of electric solenoid switch levers that are located on the dash panel of the truck. During blading operations the operator can automatically raise or lower the blade, tilt it forward or backward, or put more downward pressure on one side or the other . . . all instantly and automatically, while the truck is moving down the highway at speeds of up to 15 or 20 miles per hour. Angling of the ice blade either way up to 20 degrees is easily accomplished by removing and re-inserting lock pins in a different position. Lull ice blades are made of an extra heavy high carbon steel, are heavily reinforced and have removable standard punched cutting edges. When not in use, Lull ice blades can be hydraulically raised up under the truck frame so that they are out of the way for snow plowing and performing other hauling operations with the truck. The Lull electric solenoid control system is usually installed with extra control valves for the automatic operation of other truck mounted equipment such as snow plows and wings.

The Lull Engineering Co., Inc., is the oldest manufacturer of truck mounted ice blades in the United States, having introduced the product to Federal and county highway departments and contractors originally in 1931.

The Lull Engineering Co., Inc, manufactures other ice snow and sleet fighting equipment in addition to the ice blade. These products include ice crusher-rollers for fracturing glare ice, truck mounted sweeper brooms, and truck mounted under body graders. Other products in the Lull line include self propelled road and street brooms, 4-wheel drive front end loaders, high lift loaders capable of lifting 3,000 lbs. up to 40 feet, and heavy log and lumber handling equipment.

For complete information on Lull's new truck mounted ice blades and descriptive literature, write Lull Engineering Company, Inc., 3045 Highway 13, St. Paul 11, Minnesota.

Two New Swenson Spreaders

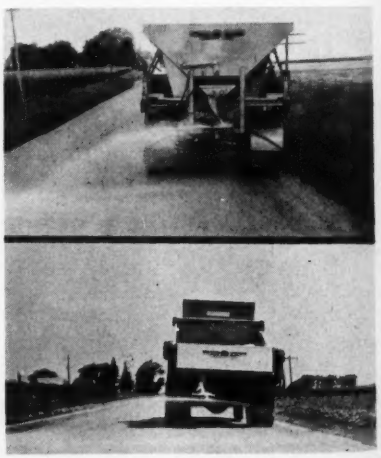
Exclusive, fast acting, hydraulic cab control of all components is featured on two new spreaders just announced by Swenson Spreader & Mfg. Company.

A movable, cab-controlled chute on both models—replaceable tail gate type and V-box type—drops the material onto the spinner in the position necessary to change the spread from left, to center, or to the right of the truck. Spinner, augers and truck speed operate independently of each other to apply materials in wide or narrow swaths, from 2′ to 45′, and in heavy or light applications, as desired. This complete freedom of speed improves ice control and resurfacing operations while working on any road surface.

Exclusive "shuffling augers" operate in opposite directions to "chew-up" any caked material, thus eliminating "bridging" or packing. Hydraulic flow control valves adjust the auger speed for different types of aggregate.

An adjustable metering gate allows precise control when spreading minute amounts of material. Any combination of sand, gravel, salt, chemical or cinders can be applied.

For complete information on these new, cab-controlled spreaders, write Swenson Spreader & Mfg. Co., Lindenwood, Illinois.



Technical Notes

THERMO-PLASTIC PAVEMENT MARKING — A SOLUTION TO STAGGERING MAINTENANCE COSTS?

By Harry H. Harrison
Formerly Engineer of Traffic,
Illinois Division of Highways

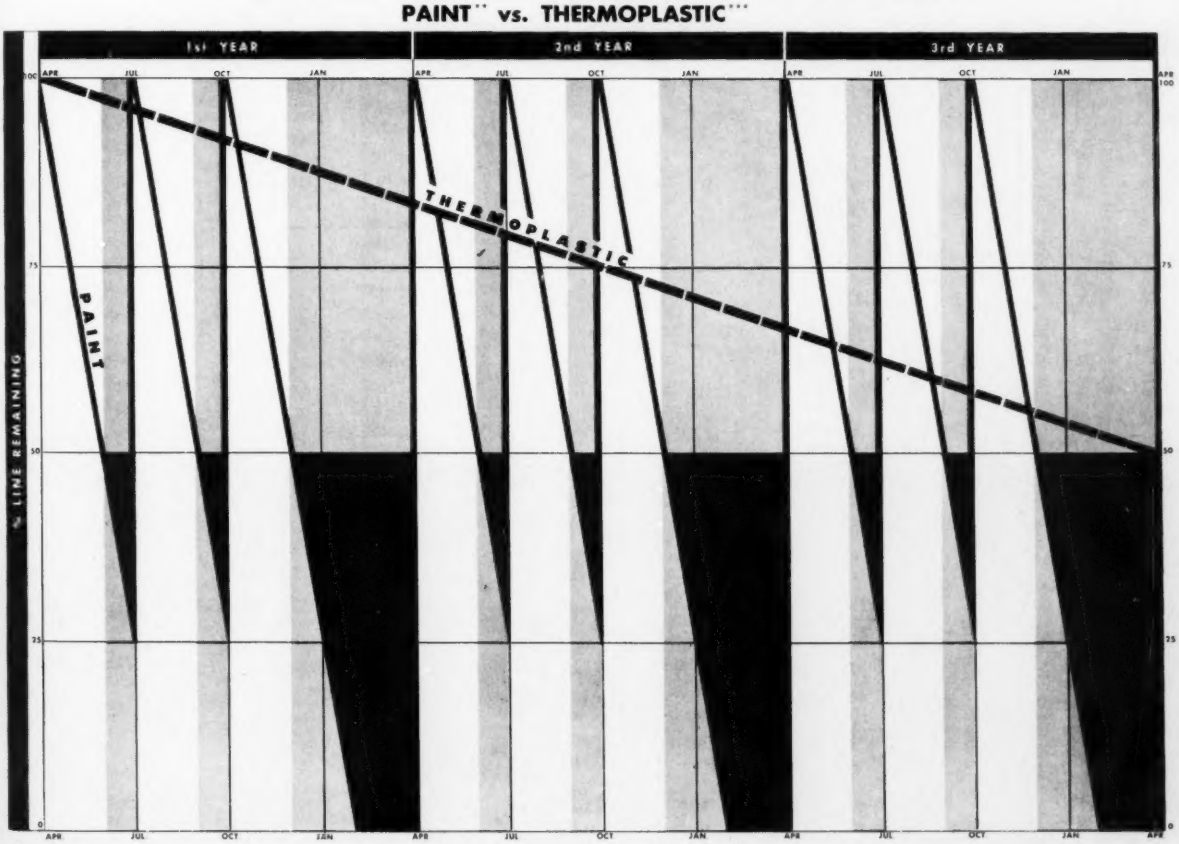
The problem and cost of placing and maintaining traffic guide lines, symbols and messages on our highways has plagued traffic and maintenance engineers ever since Henry Ford and Herbert Hoover decided there should be two cars in every garage.

Traffic and safety engineers have long been aware that pavement markings are as important to the motorist as traffic signs and signals, but until comparatively recently the materials available were so vulnerable to deterioration by traffic wear and climatic conditions that it has been impractical and often impossible to provide full-time effective service.

Until a few years ago traffic paints of various specifications were the only materials available for use in marking lane lines, edge lines, barrier lines, symbols and word messages. An exception to this was the use of formed materials which usually were cemented to the pavement surfaces. The latter materials were largely limited to the designation of crosswalks and directional symbols and messages. All of these gave variable results, and in the case of traffic paint an optimum performance on low volume highways of one year was the most that could be expected, and high volume highways required marking a minimum of two times and often four or more times a year. As a consequence the resulting "no line" time and necessary repainting time increased traffic hazards according to many authorities, by threefold. (See chart).

The Illinois Division of Highways, seeking greater permanence of pavement markings, began experimenting with thermo-plastic materials in 1956, shortly after they came on the market. While many deficiencies were observed in the original applications, the performance was sufficiently encouraging that test applications of successively greater footage have been continued each year since 1956 with the total now reaching well over a million feet. Improved performance has been noted, and increased quantities have been deemed justifiable.

COMPARISON OF PERIODS OF SUBMINIMUM TRAFFIC MARKINGS*
PAINT vs. THERMOPLASTIC*****



Shaded areas denote periods beneath minimum standards when traffic paint is used (18 months out of 36).

*Based on 50% intact marking as acceptable minimum.
**Based on painting 3 times per year, with average of 25% of line remaining at time of painting. Fourth time necessary, but not done because of weather.
***Based on written and bonded guarantees of Thermoplastic manufacturers.

During 1961 approximately 534,000 feet of 5-inch white lane lines, 4-inch white edge lines, and 5-inch yellow lines have been placed in Illinois. More than 60% of the thermo-plastic used to date has been applied on heavily traveled multi-lane expressways where durability performance, lower maintenance costs, and greater safety for the motorist have been considerable as compared with painted lines.

In the development of thermo-plastic materials a certain amount of pioneering with calculated risk was necessary on the part of users to encourage producers in such development. This risk has been held to a minimum, however, because of guarantees of replacement made by Cataphote Corporation and Perma-Line Manufacturing Corporation of America—leading producers.

Heretotore the usage of thermo-plastic in Illinois had been considered experimental, but the improvements in reflectivity, color and durability now justify more extended use; this extended use will in turn, lower original application costs and ease the heavy burden of the cost of maintenance with which the states will be faced. It now appears that thermo-plastic pavement markings may be the solution to the staggering maintenance costs to come not only on the heavily traveled state roads, but also on the more than 41,000 miles of the new Interstate Highways to be maintained by the states.

POSITIONS AVAILABLE

(Continued from page 38)

AUTOMOBILE CLUB OF NEW YORK

Position: Traffic Engineer—primarily to act as consultant to communities in the New York metropolitan area ranging in population from 5,000 to 100,000. Must be able to accept full charge. In addition, to participate in broad Club activities in traffic engineering and traffic safety at the local, state and national level. Fine opportunity for man with a sound technical background and ability to establish and maintain effective contacts.
Requirements: Graduate engineer with traffic engineering experience.
Salary: Commensurate with experience.
Apply: Charles J. Murphy, Director, Traffic Engineering & Safety Dept., Automobile Club of New York, Inc., 28 East 78th Street, New York 21, New York.

TENNESSEE DEPARTMENT OF HIGHWAYS

Position: Traffic Engineer to be in charge of establishing traffic operation plans in smaller cities in cooperation with local officials. Will act in consulting capacity to local governments on all phases of traffic engineering.
Requirements: Graduate Engineer with a major in Civil Engineering. Five years, within the past ten years, of successful full-time paid employment in Highway Engineering, of which three years must have been in responsible traffic engineering work.
Salary: $650 - $790. Beginning rate based on qualifications and experience.
Apply: Mr. E. C. Tayloe, Personnel Officer, State of Tennessee, Department of Highways, Nashville, Tennessee. Telephone—CHapel 2-8311, Extension 2448.

AAA WISCONSIN DIVISION MADISON, WISCONSIN

Position: Traffic Engineer to start April 1, 1962, replacing incumbent who is retiring. To work on all phases of traffic engineering with cities in Wisconsin and Iowa which do not have traffic engineers, cooperating closely with state and local officials.
Requirements: Engineering graduate plus adequate traffic engineering experience.
Salary: $10,000. Will pay interview, moving and travel expenses to Madison.
Apply to: Stuart B. Wright, General Manager, AAA Wisconsin Division, 103 N. Hamilton St., Madison, Wisconsin.

GOVERNMENT OF THE DISTRICT OF COLUMBIA DEPARTMENT OF HIGHWAYS AND TRAFFIC

Traffic Engineering Division

Position: Supervisory Highway Engineer.
Salary: $8955 - $10,255.
Requirements: BSCE degree with training and experience in traffic engineering and highway planning or design, and preferably a knowledge of data processing.

Position: Highway Engineers.
Salary: $5335 - $8860.
Requirements: Degree, preferably BSCE, with experience in highway layout, design and estimating and experience or training in traffic engineering. For some positions a knowledge of data processing is desirable.

Position: Traffic Engineers.
Salary: $6345 - $7425.
Requirements: BS degree, preferably in CE or EE. Available positions include duties in (1) street designs as related to traffic and operational needs; (2) signal layout and coordination; (3) design of traffic signals and street lights; and (4) operational experience in applying all phases of traffic engineering to city problems. Experience in one or more of these duties is required.

Office of Planning and Programming

Position: Highway Engineers.
Salary: $6345 - $8860.
Requirements: BSCE degree with experience in planning and/or design of freeways, some experience in urban design is desirable. One position requires some experience in right-of-way engineering.
Benefits: Federal retirement, sick and vacation leave, and participation in insurance and health benefit plans.
Apply: Personnel Officer, Department of Highways and Traffic, District of Columbia Government, 14th and E Streets, N. W., Washington 4, D. C.

CITY OF CINCINNATI, OHIO

Position: Traffic Control Engineer. Responsible position for qualified man in progressive municipal traffic engineering organization.
Salary Range: $6724 - $8392 per year, starting salary commensurate with experience.
Apply: George W. Howie, Director of Public Utilities, 323 Plum Street, Cincinnati 2, Ohio.

Participating Organization—1961

The following organization, in addition to those previously listed, has contributed to the Technical Development and Research Fund of the Institute of Traffic Engineers in 1961, and has therefore been designated by the Board of Direction as a "Participating Organization" as provided in Section 2 of Article XI of the By-Laws:

Liberty Mutual Insurance Company
175 Berkeley Street Boston 17, Mass.
Charles A. Goodwin, Representative

Institute Affairs

Membership Approves Constitution and By-Laws Changes

Two propositions relating to changes in the number of Directors and in certain membership provisions have been approved by vote of the Institute membership. Tellers Wallace L. Braun and William L. Carson have reported to President Malo that the vote was overwhelmingly in favor of both changes. In each case, there were 625 votes in favor of the change and 23 opposed. The canvass of ballots was conducted on November 6 at the headquarters office in Washington, and the amendments became effective 30 days later, on December 6.

One proposition increases the number of Directors of the Institute from six to seven. It is the intention of the Board of Direction to create a seventh district which will comprise all of Canada, thus allowing the Canadian membership to have direct representation on the governing board of the organization. At the January meeting of the Board, if such a district is created, an automatic vacancy will exist on the Board, and under the By-laws the Board of Direction must appoint someone to fill the vacancy. Presumably a Canadian would be appointed to this spot.

The other proposition involves a number of changes in the sections of the By-laws relating to membership. Importantly, the changes eliminate all reference to ages in connection with the requirements for membership. In the case of Junior Members, on which there was formerly a maximum age limit of 35, a rule is now established which sets eight years as the maximum time a member can remain a Junior Member. By the end of eight years, it is assumed he will be ready to transfer to a higher grade or will have dropped out of traffic engineering. A man may start in the Junior classification at any age, however, as opposed to the previous rule which prevented those 35 years of age or over from entering as Junior Members.

Another significant change provides for a new grade of Student Member. Certain simple qualifications are established—principally registration in a traffic or transportation engineering course in a recognized school—and a maximum time is set for remaining in this classification. A fee of $5.00 a year, without an entrance fee, is set for Student Members. A change is made in the rules for Student Chapters, providing that these Chapters shall be made up of Student Members.

Certain other technical changes were made in the number of votes on the Board of Direction required for election, and in the specific method by which educational credit can be substituted for experience in meeting requirements for all grades.

The full revised text of the Constitution and By-laws will appear in the 1962 Yearbook.

Technical Council News

Technical Council Seeks Project Suggestions

The Technical Council of the Institute of Traffic Engineers is seeking suggestions for projects which could profitably be undertaken by Technical Council committees. This request was authorized during the Annual Meeting as one means of permitting greater participation by all members in the activities of the Institute.

Between the winter meeting in January and the spring meeting in April the Department Heads together with their Standing Committees develop the projects which are to be undertaken during the next committee year. Great effort is expended by these people to develop projects to answer current questions. However, it is not possible for a few people to be aware of all of the technical and administrative problems which are being faced by the members in their everyday work and for which they can not find adequate answers in the present body of literature.

Therefore, the Technical Council is encouraging every member of the Institute as well as other interested persons to register their suggestions by writing the appropriate Department Head, the Chairman, or the Secretary. The Council is seeking all suggestions for needed research. Quite possibly there will be a number of suggested projects which require research or development beyond the means of a Technical Council committee. These projects could form the basis for a list of research projects in traffic engineering to be used by graduate students for thesis study or by researchers working with grants from the Technical Development and Research Fund and other sources. Because the traffic engineering profession is still young and growing, the Council expects that there will be many areas where additional study is needed.

The names of the people to send suggestions to are:

Chairman—Carlton C. Robinson. Department 1—Charles W. Prisk; Department 2—Mr. Robinson is handling this department until a new head is selected; Department 3—William R. McGrath; Department 4—S. Cass; Department 5—C. J. Keese; Department 6—Donald S. Berry; Department 7—Marble J. Hensley; Department 8—(a new department for "Characteristics of Traffic and Traffic Movement")—Matthew J. Huber; Secretary—Stephen G. Petersen.

Section News

MISSOURI VALLEY SECTION

Local News. Four cities in the Missouri Valley Section received awards for high performance in Traffic Engineering as evaluated by the 1960 inventory of traffic safety activities. These cities were Tulsa, Oklahoma, Little Rock, Arkansas, Clayton, Missouri and Garden City, Kansas. The various shops of the Tulsa Traffic Engineering Department have moved into their new Traffic Engineering Maintenance Building. The new building was designed specifically for the Traffic Engineering Department's needs and is air conditioned. The voters in Tulsa recently approved a bond issue for Traffic Signal Additions and Revisions; this work will start in 1961.

Oklahoma City voters approved a one million dollar Traffic Improvement Bond Issue in April. This bond issue will include signalization, street marking and other traffic control devices. Work is now starting on the traffic signal portion of the program. In Little Rock, Arkansas, the Interstate Route 30 bridge across the Arkansas River leading from Little Rock to North Little Rock has been opened to traffic and is now carrying about seventeen thousand vehicles a day relieving the heavy congestion of traffic on the other two bridges across the river.

The City of Wichita reports that a program of overhead sign installations will start in 1962. The first installations will be made on the state and Federal highways within the city. Wichita is now about ready to take bids on a new traffic signal control system for the central business district. The new system will control ninety-four intersections.

In Nebraska the last link in Interstate Route 80 between Lincoln and Omaha has been completed and the entire 52 mile section of Interstate Highway is now in operation. The Traffic Engineering Section of the Nebraska Department of Roads has completed plans for all signing on this section and the five contracts for a total of about $500,000 have been awarded.

FLORIDA SECTION

The Florida Section sponsored its second annual Conference on Traffic Operations at the University of Florida at Gainesville. The Florida Municipal Electric and Traffic Lighting Association was a co-sponsor of the meeting.

With the departure from the state of Jack Barr, who was the vice president of the Florida Section, Henry Boggs, former secretary-treasurer, has moved up to the vice-presidency, and Lamar Thomas has been appointed secretary-treasurer. The officers of the Section are therefore:

President—George H. Kunde; Vice President—Henry P. Boggs; Secretary-Treasurer—Wm. Lamar Thomas, 505 City Hall, Orlando, Florida.

WASHINGTON (DC) SECTION

The Washington Section will hold a dinner meeting during the Highway Research Board meeting, with all ITE members and others cordially invited. The date: Tuesday, January 9. The place: to be announced. The speaker: an outstanding figure in the highway and traffic field. Tickets available at the Sheraton Park Hotel on Sunday and Monday, January 7 and 8.

YALE STUDENT CHAPTER

Officers of the Yale Student Chapter for the first semester of the 1961-62 academic year are:

President—Peter A. Mayer; Vice President—Leland H. Bates; Secretary—Lawrence Rogow.

TEXAS SECTION

The Texas Section will hold its semi-annual meeting at the Rice Hotel in Houston, January 19 and 20.

A Student Chapter of the Institute of Traffic Engineers is being organized at the A & M College of Texas under the sponsorship of Jack Keese, Professor of Civil Engineering and member of Tex ITE. According to Don Capelle, Chairman of the Committee appointed to organize the new chapter, the initial membership is expected to be between 15 and 20 students.

Members of the new chapter will share essentially the same privileges as regular members, except that of voting, and will be encouraged to participate in Tex ITE activities.

Pictured are some of the speakers at the Gainesville conference. Front, left to right: Melvin A. Conner, Florida State Road Department; E. A. Barton, Cleveland; Sherwood A. Hiller, Tampa; Charles A. Rose, Atlanta. Back row, left to right: Frank M. Holloway, Florida State Road Department; William A. Ramsey, Pensacola; Henry P. Boggs, Florida State Road Department; William E. Corgill, Washington, D. C.; Robert L. Cox, New Haven, Conn.

ACCIDENT EXPERIENCE

(Continued from page 24)

overpasses; various widths of turf median ranging from 12 feet to 230 feet. One fatal accident occurred at Milepost 142.5, south of Union Toll Plaza, where the median consists of 30 feet of turf. Another occurred at Milepost 144.4 where the median is about 37 feet, and grass-covered. These two fatal accidents resulted from head-on collisions. The third fatal accident involved a single car crossing the 40-foot turf median in the state section at Toms River and overturning on the opposite roadway.

A barrier fence was installed as part of the original construction in areas having a narrow median. This fence has proven highly successful in that during the four-year study period, only four vehicles penetrated the barrier and entered the other roadway. In addition to providing the necessary protection, a special feature added to the basic guide rail eliminates headlight glare from opposing traffic.

Essentially, the fence consists of the following: concrete posts, 7′ 9″ long with an 8″ square cross-section spaced 10′ apart on centers and below ground 3′ 3″, leaving a height above grade of 4′ 6″; 6″ x 10″ timber rails, attached parallel to the roadways on opposite faces of the posts, are placed about 8″ above grade; 1″ x 6″ western red cedar rails are attached to the post faces about 3″ from the top of the post and parallel to the guide rails; two 1″ x 10″ x 2′ 9″ slats are equally spaced between each pair of concrete posts.

Based on the experience to date, the Authority is now installing additional barrier fence wherever openings exist in narrow medians.

• • • if you want completely adjustable traffic signals they're manufactured by only one company • • •

Traffic Signals, inc

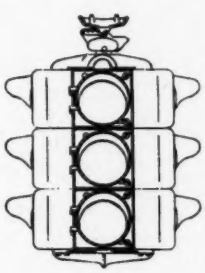
WHERE EACH SECTION AND EACH SIGNAL HEAD FEATURES FULL CIRCLE 360°

ADJUSTABILITY THROUGH TRI-STUD MOUNTINGS BETWEEN SECTIONS

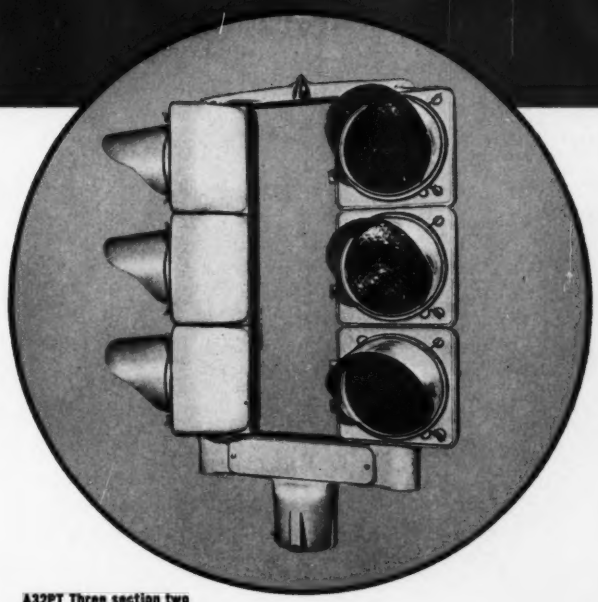
AND ON BRACKET MOUNTINGS FOR SIGNALS

This is because tri-stud mountings do not require serrations to hold each section firmly in place and can therefore be directionally adjusted to an infinite degree.

A31PM One way three section 4" post mounting



A33SW Three section three way span wire mounting



A32PT Three section two way post mount with terminal box

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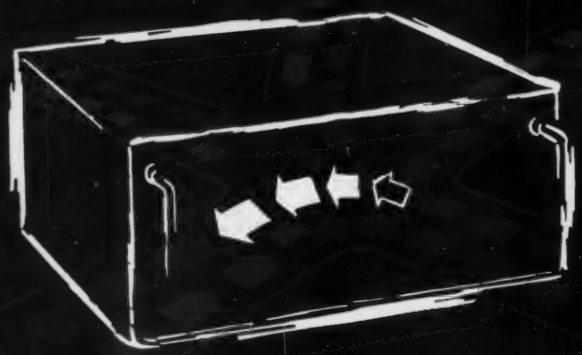

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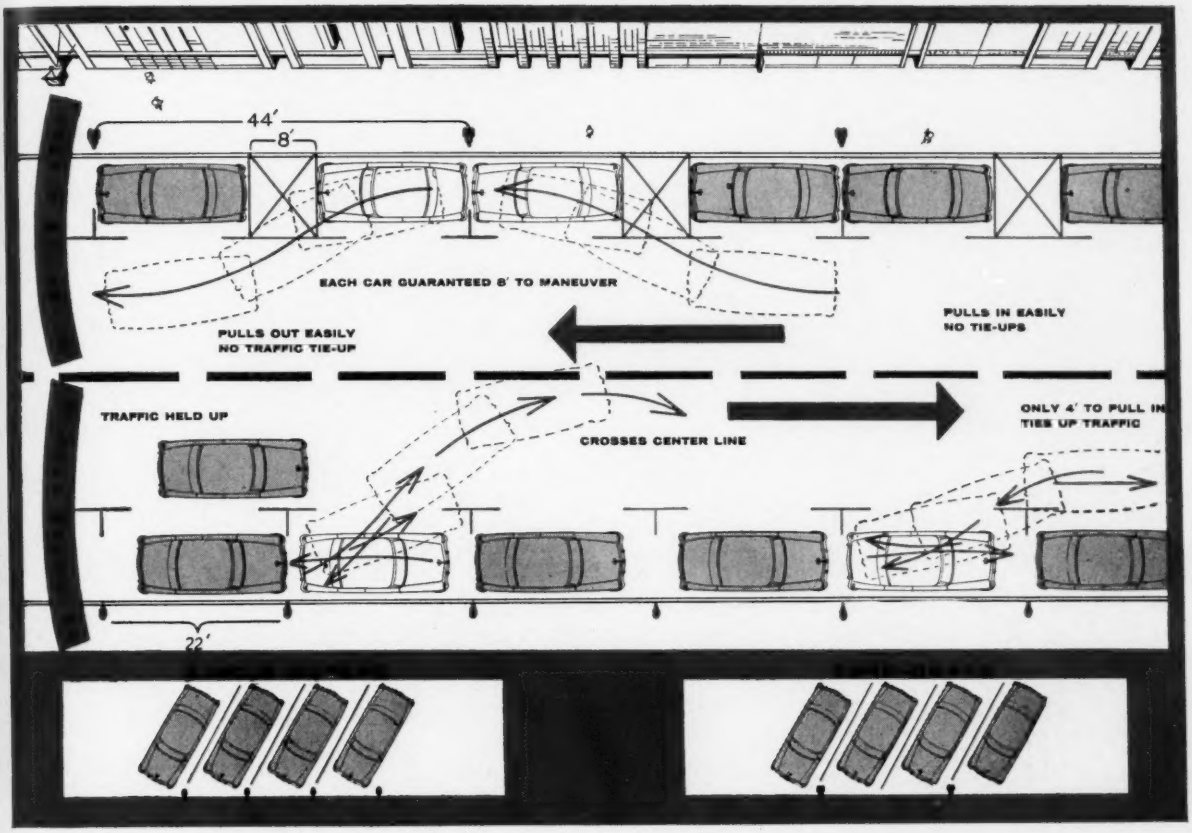

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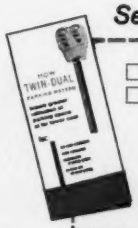

☐ Please send complete information on Twin-Duals.
☐ Please have your representative call.

Name_____ Title_____

City_____

State_____

Membership Applications

The Institute of Traffic Engineers welcomes applications from qualified traffic engineers, but does not desire as members persons who are unqualified. Listed below are the names of those from whom applications for membership or transfer in grade have been received since the last published list. Institute members are urged to review this as soon as possible and immediately inform the Executive Secretary's office if names of people are found who are known to be unqualified for ITE membership or transfer.

New Applications

BONELLI, Edward Richard
Assistant Director of Traffic Services, City Department of Traffic, New York, New York—for ASSOCIATE.

COLLINGS, Peter R.
Design & Construction Supervisor. Haddin, Davis & Brown Co., Ltd., Calgary, Alberta, Canada—for ASSOCIATE.

CRAWFORD, James Murray
Senior Traffic Engineer, Saskatchewan Department of Highways, Regina, Saskatchewan, Canada—for ASSOCIATE.

CREGER, William Ellery
Traffic Engineering Aide, (Part Time), Department of Public Works, Ames, Iowa AND Graduate Student (Part Time), Iowa State University, Amer, Iowa—for JUNIOR.

DELLAWAY, Thomas Keith
Traffic & Motorways Engineer, Auckland City Council, Auckland, New Zealand—for ASSOCIATE.

EVENSEN, Roy B.
Associate, Blauvelt Engineering Co., New York, New York—for ASSOCIATE.

FLENER, Bobby Ross
Traffic Engineer, Kentucky Department of Highways, Division of Traffic, Frankfort, Kentucky—for JUNIOR.

HATTON, Roger Lee
Associate Traffic Engineer, Division of Traffic Regulation and Engineering, City of Columbus, Ohio—for JUNIOR.

JACKMAN, William Thomas
Traffic Engineer, Cleveland Automobile Club, Cleveland, Ohio—for ASSOCIATE.

JARDINE, Kenneth Mason
Traffic Engineer, Province of Manitoba Highways Branch, Winnipeg, Manitoba, Canada—for JUNIOR.

KIMMEL, Herman Isaac
Traffic Engineer, Orange County Highway Department, Santa Ana, California—for ASSOCIATE.

MILLER, Paul William
Traffic Engineer, Edwards & Kelcey, Newark, New Jersey—for JUNIOR.

NUCKOLS, William Thomas
Sales Engineer, Kar-Trol Signal Company, Inc., Houston, Texas—for JUNIOR.

PEREZ VALENTIN, Carlos D.
Traffic Engineer, Puerto Rico Planning Board, Santurce, Puerto Rico—for JUNIOR.

RUBENSTEIN, Allen Martin
Traffic Engineer, City of Richmond, California—for JUNIOR.

SMITH, Keith Alvin
Traffic Engineer, City Traffic Engineering Department, Fort Worth, Texas—for JUNIOR.

TWEEDIE, Andrew G.
Associate Civil Engineer, Highway Planning, New York State Department of Public Works, Albany, New York—for MEMBER.

WALKER, Ross J.
Highways Engineer, De Leuw, Cather & Co., of Canada, Ltd., Toronto, Ontario, Canada—for JUNIOR.

WENDT, Garland Charles
Traffic Control Engineer I, Bureau of Traffic Engineering, City of Milwaukee, Wisconsin—for JUNIOR.

Applications for Transfer

COFFIN, John Foster
Deputy Director, Department of Traffic and Parking, City of New Haven, Connecticut—for ASSOCIATE.

HALEY, Charles Edward
City Traffic Engineer, City of Phoenix, Arizona—for MEMBER.

OLCOTT, Edward Sumner
Chief, Planning Division, Port Development Department, Port of New York Authority, New York, New York—for MEMBER.

PARKER, Harry
Traffic Engineer, Los Angeles County Road Department, Los Angeles, California—for MEMBER.

PETERSEN, Stephen G.
Staff Engineer, Institute of Traffic Engineers, Washington, D. C.—for ASSOCIATE.

RAY, James Christian
Traffic Engineer, Sacramento County, Sacramento, California—for ASSOCIATE.

WILSON, Laurence
Associate Traffic Engineer, City of San Diego, California—for ASSOCIATE.

Yearbook Changes

ACTON, Alvin A. (Associate)
City Traffic Engineer, West Palm Beach Traffic Division, 824 Newark Street, West Palm Beach, Florida. TEmple 3-0802.

AHLBERG, Rolf, G. L. T. (Associate)
Traffic Engineer, Orrje & Co., Kapellgrand 7, Stockholm So, Sweden. 101/24-20-80. SEND MAIL: Torsbygatan 10, Stockholm, Farsta, Sweden.

ANDERSON, George V. (Associate)
District Traffic Engineer, Wisconsin Highway Commission, 2 South Barstow Street, Eau Claire, Wisconsin. TEmple 5-5177. SEND MAIL: 1310 Hawthorn Street, Eau Claire, Wisconsin.

ANDRIACCHI, Louis A. (Associate)
Division Manager, Reflective Products Division, Minnesota Mining & Manufacturing Co., 1330 Centre Street, Newton Center, Massachusetts. DEcatur 2-9810. SEND MAIL: 301 Central Street, Avon, Massachusetts.

ARNAS, H. Ozger (Junior)
Civil Engineer, Traffic Division, Illinois Division of Highways, 160 N. LaSalle Street, Room 1020, Chicago 1, Illinois. FInancial 6-2000, ext. 359. SEND MAIL: 6711 N. Sheridan Road, Chicago 26, Illinois.

BARKER, John L. (Member)
General Manager & Vice President. Automatic Signal Division, Regent Street, East Norwalk, Connecticut. TEmple 8-4791.

BARNES, Charles F., Jr. (Junior)
Traffic Planning Engineer, Automotive Safety Foundation, 200 Ring Building, Washington, D. C. FEderal 8-3115.

BARR, John W. (Associate)
Roy Jorgensen & Associates, c/o Division of Planning Department of Highways, State Office Building, Frankfort, Kentucky. 227-2231, ext. 284.

BARRIERE, Jacques (Associate)
Assistant Director, Traffic Department, 9627 St. Laurent Blvd., Montreal 12, P. Q., Canada. UNiversity 1-3811, ext. 2400.

BARTLE, Richard M. (Associate)
Municipal Financing Consultant, Sonte & Youngberg, 1314 Russ Building, San Francisco 4, California. YUkon 1-1314. SEND MAIL: 238 Hall Drive, Orinda, California.

BASMADJIAN, Alvin G. (Junior)
Senior Assistant Traffic Engineer, Design Division, City Department of Streets & Traffic. 735 Randolph, 15th Floor Water Board Building, Detroit 26, Michigan. WOodward 3-5303.

BESSELAAR, Oswald H. (Junior)
van Niekerk, Kleyn & Edwards, 405 United House, Adderley Street, Cape Town, Union of South Africa.

BIDELL, William (Associate)
Construction Engineer, Toronto District, Ontario Department of Highways, Parliament Buildings (Downsview), Toronto, Ontario, Canada. CHerry 4-2571, ext. 331. SEND MAIL: 108 Three Valleys Drive, Don Mills, Ontario, Canada.

BOTZOW, Hermann S. C., Jr. (Junior)
Transportation Planner, Port Development Department, Port of New York Authority, 111 Eighth Avenue, New York 11, New York. ALgonquin 5-1000, ext. 488.

BOUMAN, Martin J. (Member)
Transportation & Traffic Engineer, City, Engineering Building, Balboa Park, San Diego 1, California. BElmont 9-7511, ext. 311.

BOXDORFER, Robert L. (Junior)
Traffic Engineer II, Traffic Division, City, 1201 Market, St. Louis 3, Missouri. MAin 1-5560, ext. 615.

BOYES, Robert C. (Associate)
Engineer i/c Traffic Operations, Traffic Division, City Engineering Department, 453 West 12th Avenue, Vancouver 10, B. C., Canada. TRinity 6-1313, ext. 324.

BRAND, Daniel (Junior)
Assistant Project Engineer, Traffic Research Corporation, 20 Spadina Road, Toronto, Ontario, Canada. 924-3381.

BRAND, J. G. (Associate)
Town Engineer, Municipality, P.O. Box 59, Windhoek, South-West Africa, 2445.

BURGER, Joseph P. (Associate)
Surveys & Plans Officer, Traffic Engineering, City, 1055 Home Avenue, Akron 10, Ohio. JEfferson 5-7111.

BURKS, James W. (Associate)
Senior Traffic Engineer, District 20, Texas Highway Department, P.O. Box 3190, Beaumont, Texas. TErminal 2-1691.

BURNFIELD, Roye George (Associate)
Senior Project Location Engineer, Planning & Design Branch, Ontario Department of Highways, Parliament Buildings, Toronto, Ontario, Canada. CHerry 4-2571, ext. 571. SEND MAIL: 109 Harding Blvd., Richmond Hill, Ontario, Canada.

CAPELLE, DONALD G. (Junior)
Assistant Research Engineer, Texas Transportation Institute, A&M College of Texas, College Station, Texas. VIctor 6-5707.

CAVALLERO, John P., Jr. (Junior)
Traffic Assistant, Department of Traffic & Parking, City, 200 Orange Street, New Haven 11, Connecticut. LOcust 2-0151, ext. 396.

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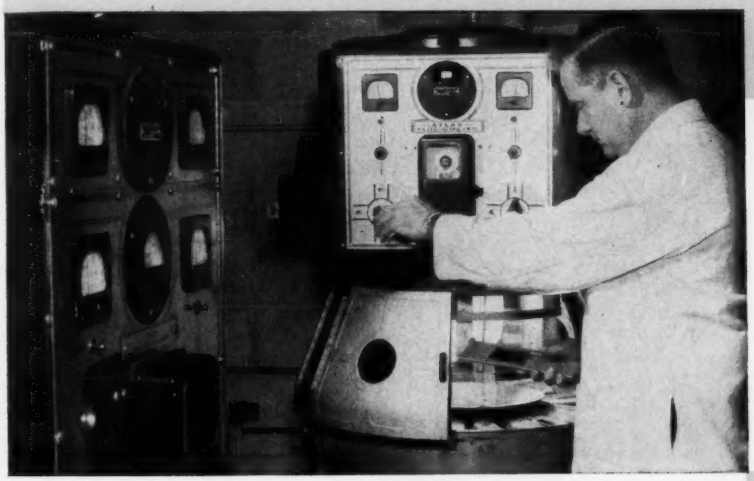

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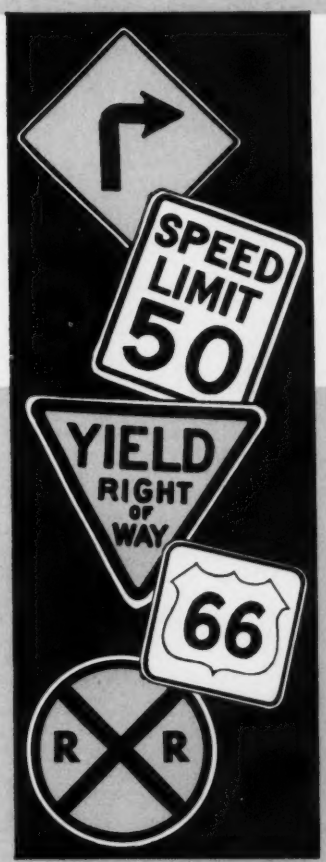

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Chief Engineer, The National Fence Co., 40 Ames Avenue, Meriden, Connecticut. BEverly 7-7474. SEND MAIL: 185 Preston Drive, Meriden, Connecticut.

CHANN, Irving K. (Associate)
Associate Engineer, Wilbur Smith & Associates, 495 Orange Street, New Haven, Connecticut. UNiversity 5-2191. SEND MAIL: 50 Kathrine Drive, Hamden, Connecticut.

CHRONISTER, Joseph S. (Associate)
Traffic Engineer, City Traffic Commission, 802 Second Avenue South, Nashville, Tennessee. ALpine 6-6621.

CLEARWATER, Louis L. (Member)
Senior Traffic Engineer, Operations, Department of Traffic, Room 1000, City Hall, Los Angeles 12, California. MAdison 4-5211, ext. 2257.

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Deputy City Engineer, City Hall, Engineer's Office, Fort William, Ontario, Canada. MAyfair 2-7796.

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Traffic Planning Engineer, City, Municipal Building, 101 W. Third Street, Dayton 2, Ohio. 222-3441, ext. 406.

DeBIASI, Domenic (Associate)
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Assistant to District Engineer, District 3, Illinois Division of Highways, 7700 East Norris Drive, Ottawa, Illinois. 2131. SEND MAIL: 526 Marcy Street, Ottawa, Illinois.

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ELMBURG, Curt Martin (Associate)
Chief Traffic Engineer, Gothenburg Transit Authority, P.O. Box 424, Gothenburg 1, Sweden. 031-174220.

EMERMAN, Stephen Jay (Junior)
Traffic Engineer, City, 1444 W. Garvey Avenue, West Covina, California. CUmberland 3-5872.

ERION, Lawrence M. (Junior)
Deputy City Engineer, 145 King Street, St. Catharines, Ontario, Canada. MUtual 4-4321.

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Deputy Road Advisor, Ministry of Railways & Communications, Government of Pakistan, Karachi 1, Pakistan. 5-0739. SEND MAIL: 68-D, Garden Road, Karachi 3, Pakistan.

HESKETH, Frederick A. (Junior)
Assistant State Traffic Engineer, Traffic Engineering & Highway Planning Section, Department of Public Works, 245 A State Office Building, Providence, Rhode Island. JAckson 1-7100, ext. 581.

HIGGS, Robert W. (Associate)
Traffic & Photogrammetric Engineer, Development Engineering Branch, Department of Public Works, Tupper Building, Ottawa, Ontario, Canada. 97-4487.

HODGEN, Robert (Associate)
Traffic Engineer, Scott & Wilson, Kirkpatrick & Partners, 47 Victoria Street, London S.W. 1, England. ABbey 5-921.

HOLSINGER, Robert G. (Junior)
Student, Yale Bureau of Highway Traffic, 311 Strathcona Hall, New Haven, Connecticut. TRinity 8-4969. SEND MAIL: 5 Mont Street, Woodmont, Connecticut.

HOOPER, Paul C. (Associate)
Traffic Operations Engineer, King County Engineers Office, 905 County-City Building, Seattle 4, Washington. MAin 2-5900, ext. 575.

HORINE, Harold H. (Associate)
Engineer of Traffic Regulations, Indiana Department of Highways, 100 N. Senate Avenue, Indianapolis 4, Indiana. MElrose 3-4532. SEND MAIL: 758 N. Main Street, Frankfort, Indiana.

HOWE, Robert T. (Associate)
Associate Professor of Civil Engineering, Univeraity of Cincinnati, Cincinnati 21, Ohio. KIrby 1-9337. SEND MAIL: 1516 Northview Avenue, Cincinnati 23, Ohio.

IRELAND, Eugene F. (Associate)
Radio Traffic Light Control Representative, Motorola Communications & Electronics, Inc., 1616 Rollins Road, Burlingame, California. OXford 7-3660. SEND MAIL: 1416 Governor Stevens Ave., Olympia, Washington.

IRWIN, Neal A. (Junior)
Vice President, Traffic Research Corporation, 10 Columbus Circle, New York 10, New York. COlumbus 5-1960.

KANSMAN, Sven (Member)
Traffic Engineer, Department of Public Works, Metropolitan Dade County, 850 N. W. 23rd Street, Miami 37, Florida. FRanklin 7-5861. SEND MAIL: 850 N.W. 199th Street, Miami 69, Florida

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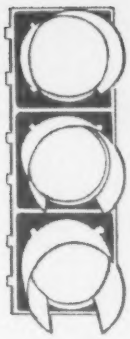

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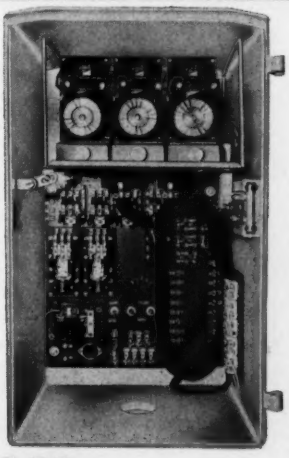

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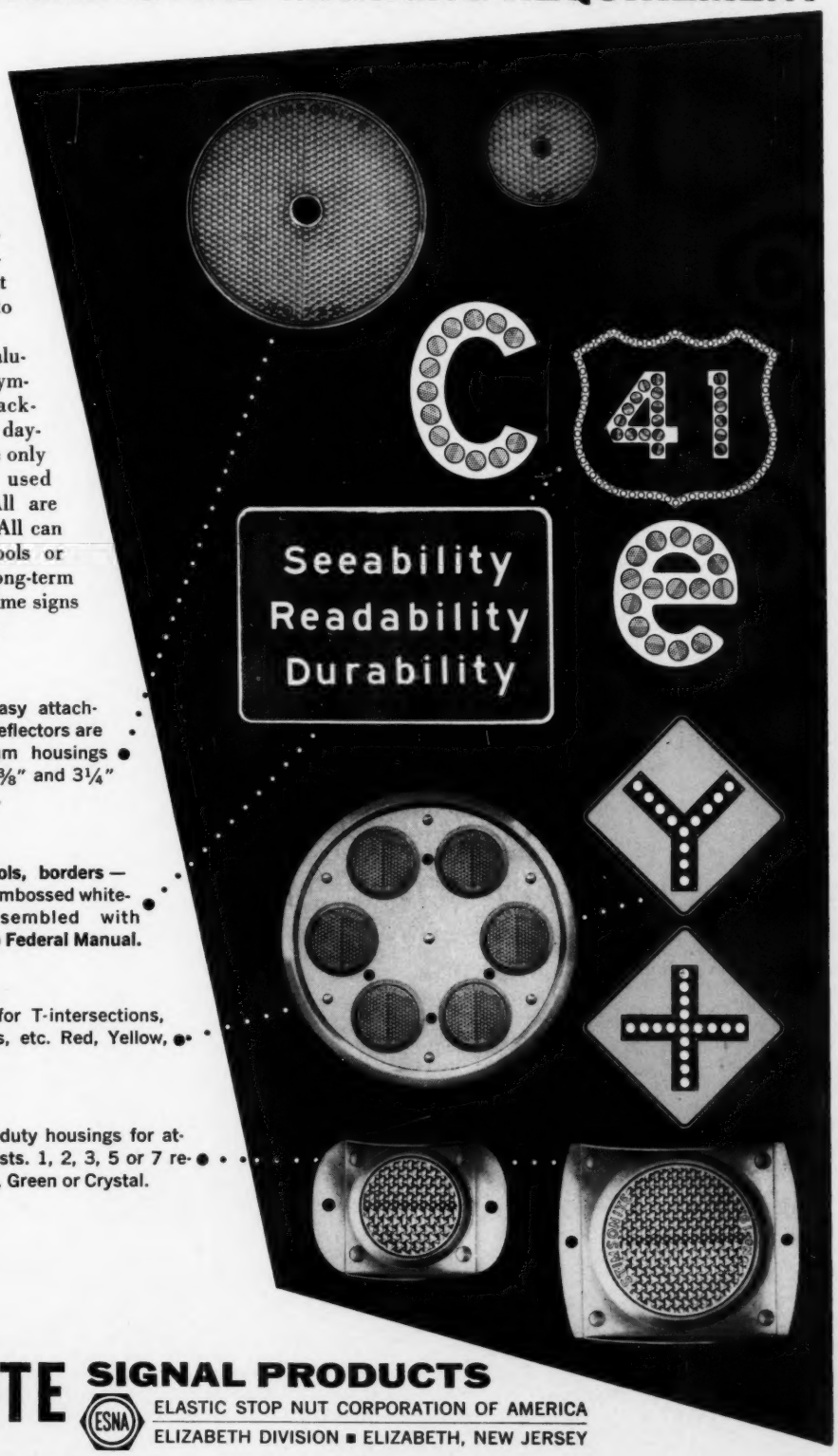

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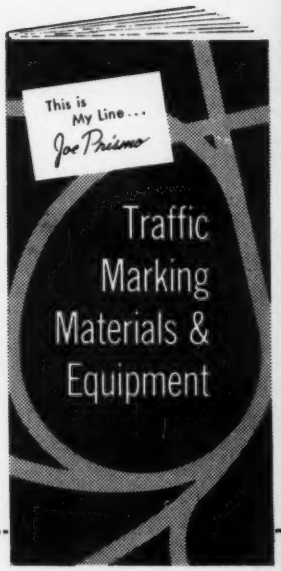

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